Logos and Prediction. Human Speech in Reasoning and Computation of Man-Machine Interaction

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This article examines the concept of prediction as a process of communication in the tradition of the humanities, especially philosophy and rhetoric, and contemporary computational applications of prediction in the digital environment with a focus on speech and the function of the voice. Despite showing that the historical path and contextualizing environment for the use of the concept is different in both areas, we argue that applications of this concept are related and present in the performance of reasoning and computation. The process of reasoning of the human mind has been treated in the humanities since antiquity. It is compared with the automated computational processes of machines using *AI* that result in predictions. We show and discuss the different conditions, means, and types of predictive methods and claim that in both cases the predictive outcome is limited to the previously given knowledge. But while purely computational prediction by *AI* is framed by its digital environment, prediction as the result of reasoning of the human mind can undergo modifications.

1. An Introduction to Prediction as Communication: The Concept of Prediction in the Theory of Communication in Approaches of the Humanities and in *AI* Technology

Prediction as Communication
Probably since the time the human species was able to express itself predictions have been used as a way to obtain knowledge about the future. Certain predictions were and are made in relation to a supernatural power or religious belief; examples are prophecies or oracles uttered by humans or utterances made with the support of reference systems that establish relations between the world and the reference system with its symbols like the ones employed in numerology or astrology. As approaches with imaginative components these types of performances are distinct from reasoning and factual data about the real world that also can be constitutive for other types of predictions. In a generalizing definition we can say that prediction is a process or its resulting statement about the emergence of an event with the claim that the event happens/exists. From the perspective of its promoters this process usually comes with the claim of having an inherent and true knowledge expressed, but this feature of truth is not a necessarily implicit one. A prediction expressed in oral speech as the means of its communication process contains as a statement a representation of the world we live in that is presented in uttered speech establishing a relation between words and things. It can also be framed in the area of the human mind for a *prediction as reasoning* as the place of its origin and linked to the tradition of the humanities. On the contrary, technical processes

in other sciences are considered the source of *prediction as computation*. Here a prediction is a process or its result within a technical environment with no or low human impact. An example is the execution of an algorithm with mathematical operations. We will use this distinction of *prediction as reasoning* and *prediction as computation* as the heuristic means to find and discuss respective cases related to speech.

The ambivalence of the concept of prediction and its applications is not unknown in scholarly circles and becomes obvious at the point of the borders of a specific scholarly discipline. A prediction is commonly associated with events of the future, but this is not an exclusive necessity for its applications. So Brungardt[1] states that "prediction is the act of judging or inferring a statement about the future. Because rational existence is temporal, the human being has the ability to guess or argue about what will exist in the future." In the Aristotelian tradition for the decision about the truth or falsehood of future made in the present state "the Aristotelian answer is that at the present time such statements are neither true nor false but indeterminate." In a prediction as a part of modern mathematics "the outcome of a process is calculated from predetermined variables." Sarewitz[2] notices that "whereas common usage of the word *prediction* refers to the foretelling of future events, philosophers of science have viewed prediction as the process of deducing consequences from hypotheses independent of any sense of time." A prediction –be it as reasoning or as computation– implies a process to reach from a state of what is given to a resulting state as a predicted statement/event that can be true or false. Any prediction claims to be of value as knowledge within its systemic framework. This framework can be a religious belief in a culture, a specific location where observed data are collected, or a digital software application of *AI* for data manipulation.

Predictability as a scientifically reachable quality present as knowledge is the featured variety of knowledge that we will examine in this article for the classical tradition of academic science in the humanities, particularly philosophy and rhetoric, and the research approach that is based on reckoning and computation and common in natural and technological sciences. We are interested in the conditions that exist in philosophy and technical sciences for prediction processes involving communication. Human reasoning has been cultivated in the humanities and its main figure for philosophy, Aristotle, elaborated on the conditions of knowledge in his work. In later emerging scientific approaches of the humanities the reasoning of the mind is implicitly a method of prediction within the disciplines logic, dialectics, and rhetoric. Reasoning has been described in the classical humanities by the terms *logos* (λόγος) and *ratio.* Here it is considered to be a human mental ability that refers to the basic process of collecting in counting and speaking. For this process *An Intermediate Greek-English Lexicon* (1889) distinguishes between two verbs *λέγω*. Aristotle in his *Nicomachean Ethics* (1102b) describes the *λόγος* as belonging to the soul, whereas the opposite, the *ἄλογος*, exists besides the *λόγος* that we praise in powerful persons and persons without power present as the *λόγος* of the *soul* (*ψυχή*). ("*τοῦ γὰρ ἐγκρατοῦς καὶ ἀκρατοῦς τὸν λόγον καὶ τῆς ψυχῆς τὸ λόγον ἔχον ἐπαινοῦμεν*"). While the Aristotelian *λόγος* is a faculty in the Greek cultural history that even exceeds the human mind, it has also the simple meaning '*speech*' in the works written by Aristotle, especially in his *Rhetoric*, and in other Greek rhetorical treatises that contain this specific meaning of the term. In the course of the reception of ancient Greek culture this concept continued to exist in vernacular European languages.

Prediction and Speech
As a process and product of technology *prediction as computation* lacks natural speech, even though comparisons of computational devices and environments to the human being and the claim of the processing, representation, and even creation of human speech are present in computer sciences and their professional applications. Even the descriptive expression *artificial intelligence* refers to a conceptual equivalence of the function of intelligence. In the case of natural speech processing a

compatibility of human speech and artificially created speech is considered to be present in the respective technology. We open our argument with the statement that the practice of human reasoning and technical computation occurs in different areas, the human mind and external technical tools. The implicit claim of a continuation, equivalence, or compatibility of the human mental faculty and the computational performance in technique is present in the current neologisms coined by *AI* technology and its applications to praise itself as new and equipped with human features. Knowledge is also a value that is promised here, for example, when for the usage of algorithms the concept of learning for a machine with a neutral network of algorithms is compared with the human brain as *machine learning*, a term coined for a whole branch of research. This metaphoric field for the description of features of machine learning continues in the anthropomorphic design of digital computational environments and its vocabulary as a consistent allegory of the style of the technical terminology for contemporary media.

The modern concept of prediction contains in its basic meaning a communication process that is performed by speech, especially by the oral speech of the voice employing a natural language to communicate. The historical linguistic origin of the noun *prediction* with the Latin prefix *pre* for 'before' and the noun *dictio* for 'speaking' shows that its meaning and function are related to linguistic means of communication. Its Latin origin of the verb *praedicere* with the meaning 'foretell' did not exist in classical Latin, but emerged with this meaning in ecclesiastical Latin, while its basic meaning in classical Latin is to make something public by crying out.[3] So the aspect of sharing publicly by speaking out is a part of its implicit meaning.

Prediction as a communication process can be generally defined as (a) the communicative process of prediction and (b) what is communicated as the knowledge that results from preceding knowledge. A prediction can stem from different types of previously given propositions like factual knowledge, assumptions, or speculations. As a particular prediction in the communication process the human speech, especially how it is by Aristotle described as λόγος, is powerful: The prediction made by a human is usually associated with mental processes and representations that are communicated in speech as the means of the resulting prediction bringing the might of knowledge to the persons who possess this might. The result can even come as apparently communicated contents in a mediated form like a written text or a visualization. A prediction as foretelling refers to the state of the future and without the framework of time it can be described as a result from a present state of knowledge to a later state of knowledge. Prediction as a communicative process and expression can be defined as the production of representations about a given thing in the distribution of a true or otherwise world-reflecting knowledge about its features like qualities, location, events, states, or behaviors. These representations can range from speech to writing, images, or symbols in natural speech to other representational symbolic systems that exist in mechanical and technical tools. A prediction can be achieved in various ways ranging from an imaginative or a reason-based use of the mind to the means used in technical approaches.

Speech is generally studied by linguistics as natural speech. Prior to the emergence of linguistics and modern approaches of communication studies in the liberal arts-tradition rhetoric, grammar, and dialectics described rules for communication. Traditional disciplines taught the rules for steps of a prediction as a process from previous knowledge to new knowledge and relied on speech as the means of their discourse. As a process of gaining knowledge communication with speech implies two areas: (1) The process of communication from the mind to speech or another means of communication and (2) the formal communication process of steps performed in speech or mediated speech.

AI and Prediction
Nourbakhsh and Keating[4] notice that in the 'big data revolution' the "power stems from the application of machine learning to big data. The computer can find patterns that are highly

individualized in massive datasets and can use these patterns to learn how to predict future behaviors better than any human being." Franchi[5] mentions concerning the emergence of *AI* that it "was born when the Sciences of the Artificial took over problems from the Humanities (and nothing else)." One of these problems can be described as how to make predictions as knowledge in a reasonable way that derives from digitally collected and processed data. Predictions are and were treated as the results of the actions of the human mind, but with *AI* a new area of prediction seems to have been created. Elson[6] mentions that "the question of whether computers can be creative in an artistic or rhetorical sense (see combinatory and automatic text generation) reaches the crux of AI as a whole." Concerning the mind as means of prediction Goldstein[7] states that "prediction is not a monolithic mechanism that operates in the same way across its functions." Jenkins[8] notices in his historical review that changes for communication and media in the future were anticipated as assumptions of rhetoric in the late 20th century: "In the 1990s, rhetoric about a coming digital revolution contained an implicit and often explicit assumption that new media was going to push aside old media." Prediction is one of the acclaimed features of digital *AI* components that are employed in computational science. Related applications increasingly spread *AI* in business life and other social areas that are interested in economic forecasts.

Based on logistic processes the applications for prediction in *AI* communicate to the user data that result from algorithmic operations. When the data form statements about coming events developed in a technical environment, the term *prediction* in its previously elaborated meaning *prediction as computation* can be applied. These communication processes in *AI* environments can be distinguished in communication as

(1) communicating data to the machine for establishing results from datasets in a process from input to output involving the algorithm

and

(2) actual communication as the performance of the man-machine interaction.

In machine learning and *AI* the equivalent to a human reasoning process is undertaken by a machine based on data that are treated by algorithms. The human person might be the source for this input, but data mining can also be an automated process. The aim is to make predictions about events of the future based on computations that function by autonomous or controlled tools for the prediction, e.g. in models. An example of communication based on predictions with *AI* is the communicative interaction between an *AI* chatbot and a human. In the evolutionary prediction McLuhan formulated in *Understanding Media: The Extensions of Man***[9]** with the underlying assumption that media are the extensions of the human body and its faculties his forecasts. These forcasts are based on the historical process of increasing media use as a scenario of the future of media use and a simulation of human consciousness of the mind. In his own words this increase of media results in "the final phase of the extensions of man" with a "technological simulation of consciousness". Here the 'creative process of knowing' is "collectively and corporately extended to the whole of human society". It is a final process that replaces the individual human and the personal area of experience, since "we have already extended our senses and our nerves by the various media." McLuhan speaks here about the extension of the human in media and describes the mediated future as a 'simulation' of human consciousness of the mind. The ubiquity of the mediated knowledge as simulated consciousness that exceeds the human body-mind unit is the scenario McLuhan develops. We can call it the idea of the increasing virtual eccentricity of the human mind.

Is it just a promise that cannot be kept and a superficial design of a technology for lookalikes of the human being that make prediction in *AI* attractive? Today much of the linguistic framework of computation technology employs metaphors that are analog to the human mind and ascribe to its

applications features that are similar to the human area of the mind and its communicative abilities like speech. Computational technology as the medium and location plays an essential role in the prediction processes of contemporary computation technology: The medium is not only the physical tool for the representation of a particular prediction but also the means of representing data and the computation process. The digitality of the media constitutes the environment of the operations. In this regard the medium exceeds the functions of a simple device that mediates knowledge. Its formalization of what is called data and the arrangement of data alter the actual identity of a thing as a unit and its representation, e.g. by symbolic representations like numbers or words, and limits it to selected values that are represented and undergo the computation process. Providing the means of prediction such technical media play a role in the processes of the production and communication of predictions as their environmental space. Speech is present in this space that is different from the human body with its physical and mental components. The question *Can the technical medium (in contrast to the human body) produce speech as knowledge or is it limited to communication of speech?* is a variation of our research question that we introduce in the next part.

Topic, Question, Method, and Argumentation
Speech is an interesting aspect of prediction, but not only at the level of the Latin etymology that traces it to *dictio* and connects it to speech and conceptual relations we introduced previously in this section of the article. Speech is what communicates the prediction, but speech is also what is in the communicated prediction. Our discourse will focus on its relation to prediction in the cases of human reasoning and the technical performance of machines. The question *Is AI-empowered speech a form of reliable knowledge?* emerges here and will be discussed. The technical advances and conditions for *AI*-based operations that aim at producing knowledge with reference to speech challenge two positions: (1) The position that speech in *AI* environments lacks features of what we introduced as speech as λόγος and its predictable features and (2) the position that an indifference exists in terms of speech in prediction in a natural and an artificial environment. Our method is to gather and discuss sources relevant to our question starting with Aristotle that contribute to the discourse on speech and prediction in order to handle the topic with the distinction between λόγος-based speech and speech as natural language in the digital environment of *AI* in this discourse. For the argumentation and demonstration of the relationships and differences in applications of the concept of prediction we have chosen the case of speech; speech exists in two types of natural language and the processed natural language or artificial language that we examine in the following section.

Anticipating the outcome of this discourse we write here that the maintained position of the concluding statement, the essential knowledge derived from the argument of this article, stems from the topology of the environment. This topology of the environment is relevant for the question of whether we can consider speech in a computation process of digitalized practice equal to the logical reasoning of the human mind or not. The resulting variety of positions depends on the framing conditions of the environment of prediction and speech. This position of ubiquity and equivalence of any speech can be considered to be elaborated in the Aristotelian philosophy as logic that is also applicable to machines that are connected to and exchange information with the human and the environment. Whichever extreme position we take (as a critical stance for the claim that *AI* as a computational process operates without the human mind or for the claim that in accordance with its self-explaining name *AI* operates with a human capability of the intellect), both positions concern speech as a means of communication and as a means of the representation of knowledge. Most concisely in part 3 of his treatise *On Interpretation* Aristotle refers to λόγος and the participle λεγομένα (*legoména*) for what is spoken in the expression τῶν καθ᾽ ἑτέρου λεγομένων σημεῖον for the definition of ῥῆμα (*rhêma*) as the sign of what is said about things. So his approach builds a bridge between the logic of the mind and the speaking of the tongue. For Aristotle λόγος is a manifestation in a voice that carries meaning by compounding in his definition *Λόγος δέ ἐστι φωνὴ σημαντικὴ κατὰ συνθήκην* (part 4). The λόγος is also the concept that establishes reasoning and

logic in his own work.

The argumentation of this discourse emerges from the following distinction as a heuristic tool: The *λόγος*-based reasoning and *prediction as reasoning* – be it in uttered words or in the language of thoughts of a thinking human being– take place in an environment that is the world. It is a reasoning process that can be influenced by anything, even interrupted, or have the implementation of a new evidential empirical experience. On the contrary, in the *AI* environment this change in a computation process is not possible except when automated, thus mechanically operated change is included in the case of *prediction as computation*. To exaggerate this heuristic distinction: The *λόγος*-based computation includes the unpredictable, the *AI* computation aims at ruling, limiting, or excluding it.

2. Speech in Prediction and Predication of the Traditional Humanities: From the *Logos*, the *Categories* and the *Underlying* in the Work of Aristotle to the Medieval *Predicamenta* and their Relevance for Speech

We look in this section at the understanding of prediction in the work written by Aristotle. In *De Inventione* (*Peri Hermeneias* (16a)) Aristotle touches on the problem of how far the *logos* (*λόγος*) actually can serve for the production of a meaningful and also propositional representation that is true or false. The concepts employed here are a foundation for logic and dialectics. For Aristotle *ῥῆμα* is a concept with the literal meaning of something expressed by the voice, but it was in the later history of scholarly studies understood as the verb in grammar and as the predicate for a predication in logic. *Ὄνομα* as the noun or subject is for Aristotle *meaning-carrying sound* (*φωνὴ σημαντική*) with the condition of the lack of time and with no part of significance apart from the rest. Aristotle defines here the *logos* (*λόγος*) as the *meaning-carrying voice* ('*Λόγος δέ ἐστι φωνὴ σημαντική*'). This definition is the ground for later emerging treatises of logic and their use of the concept of voice. Aristotle states that while *each logos* (*λόγος ἅπας*) is *meaning-carrying* (*σημαντικός*), not all have the state of factual existence ("*οὐκ ἐν ἅπασι δὲ ὑπάρχει*") or non-existence as *true or false* ("*ἀληθὴς οὔτε ψευδής*") like a *prayer* (*εὐχὴ λόγος*). We can interpret this passage as a semiotic constellation, in which propositions as parts of speech refer to reality as non-linguistic things and can be true or false. The *ῥῆμα* as the *predicate* that is associated with a *subject* (*ὄνομα*) in a statement of a sentence like *Socrates is mortal* can undergo inquiries about its existence. Another work written by Aristotle seems to be useful for the understanding of prediction. In his *Categories* ([1a]–[1b]) Aristotle writes that among the *existing things* (*τῶν ὄντων*) four different states of predictability by predication exist. The expression *ἐν ὑποκειμένῳ*, intensively used in part 2 of his *Categories*, and the abstractum *τὸ ὑποκείμενον* are a clue to the understanding of prediction in this work: This passive participle of the verb *ὑπόκειμαι* describes what is underlying knowledge important for the forming of the predicate. His actual *categories* (*κατηγορίαι*) are very concretely named by Aristotle as ten overarching values that can be used to organize or classify any knowledge.

Diderot frames a segment of the works written by Aristotle as the *books on predictions* (*livres des prédicamens*) in the article *Dialectique* in the *Encyclopédie*.[10] Diderot writes that the dialectics of Aristotle is present in his books of *predictions* (*prédicamens*) and the doctrine of propositions (*la doctrine des propositions*) in his books *De Interpretatione* and the works on the syllogism (*de syllogisme*), on analytics, on the *topoi*, and on the *elenchi* (*des analytiques, topiques & elenchiques*) that were developed in the respective treatises *Prior Analytics*, *Topica*, and *On Sophistical Refutations*. Aristotle was not the only scholar in antiquity who contributed to predictive means of logical reasoning in the tradition of dialectics. His work approaches reasoning from multiple perspectives and interprets it with the *λόγος*, which anticipates what would later be continued in the discipline of philosophy with logic and dialectics, grammar, and rhetoric. Predication as a logical process is with reference to the work of Aristotle also a process communicated with the utterance of the voice. As an authority of philosophy the Aristotelian work was continued after the end of Greek classical philosophy with his *Categories* known in Latin as *Predicamenta* that were divided into the

three sections of the *prepredicamenta*, *predicamenta*, and the *postpredicamenta.* So the Greek word for category, *κατηγορία*, is equalized with *predicamentum.* In classical Latin the noun *praedicatio* refers to a kind of public proclamation that was by Cicero recorded in his speech *On the Agrian Law* (2.18.48.).

Abaelard in his *Dialectica* employs the Aristotelian terms *antepraedicamenta, praedicamenta*, and *postpraedicamenta* as subjects of his treatise in the tradition of Aristotle describing with them what exists before the categories, the categories themselves, and what follows the categories. The concept of *voice* (*vox, φωνή*) is here extended. In the first treatise Abaelard discusses in the *Dialectica* the *antepraedicamenta* as the *five voices* (*quinque voces*) of Porphyrius, which are *genus* (*genus*), *species* (*species*), *difference* (*differentia*), *characteristics* (*proprietates*), and *communities* (*communitates*) (Vol I). As the *praedicamenta* of Aristotle Abaelard treats *substance* (*substantia*) and *quantity* (*quantitas*) besides other *predicamenta* (Vol. II, *Books I-III).* As *postpredicamenta* Abaelard treats the *significative voices* (*voces significativae*) with a reference to Aristotle's *φωνὴ σημαντική* in the *signification* (*significatio*) and *spoken expressions* (*dictiones*) that are indefinite or definite (Vol. III, *Books I-III*). In his second treatise (*Books I-III*) Abaelard distinguishes the *parts of categories* (*partes cathegoricarum*), the *species of the differences of the categories* (*species differentiis cathegoricarum*), and the *categorical syllogisms* (*syllogismi cathegorici*). In his third treatise *Topica* (*Books I-II*) Abaelard treats *places* (*loci*) and the *divisions* (*divisiones*) of Themistius and Cicero. In the fourth treatise on hypotheses Abaelard discusses the *division of hypotheses and their characteristics* (*divisio hypoteticarum earumque proprietates*) and *hypothetical syllogisms* (*syllogismi hypothetici*) (*Books I-II*). In the last treatise Abaelard discusses *divisions and definitions* (*divisiones et definitiones*) (*Books I-II*). This main work of Abaelard is a document for the translation of the Greek term into Latin. In the first section *De Praedicamentis Aristotelis* of his *Dialectica* Abaelard employs for the *uttered statement* (*ῥῆμα*) the Latin *vox* (*voice*), for the Greek *ὄνομα* the Latin *nomen* (*name*), and for *logos* (*λόγος*) the Latin word *oratio* that has the meaning 'speech' as a piece of oratory produced and delivered in the way of rhetoric. In the *Postpraedicamenta* Abaelard treats the significative voices produced by *signification* (*significatio*).

In the Aristotelian tradition reasoning by syllogisms can be described using central concepts of the Aristotelian philosophy: *Uttered statement* (*ῥῆμα*), *name* (*ὄνομα*), and *logos* (*λόγος*). The terms in the premises in syllogisms functionally serve as predicate or *uttered statement* (*ῥῆμα*) of a *name* (*ὄνομα*). When in the first premise the *uttered statement* (*ῥῆμα*) for all Xs (mortal in 'all men are mortal') is also applicable in the second premise to a single case A with an *uttered statement* (*ῥῆμα*) that qualifies A as belonging to the group of the Xs (human in 'Socrates is human'), the conclusion is that the *uttered statement* (*ῥῆμα*) of all Xs also applies to A (mortal in 'Socrates is mortal'). The features of prediction as a method of predication in the Aristotelian tradition of logic are limited to what is inherent in the subject and emerges from the concept of *ῥῆμα* as the *predicate* of a *subject* or *name* (*ὄνομα*). This setting enables the realization of *logos* (*λόγος*). Predication as the process of establishing a set of related propositions is in a non-empirical environment possible with representations of propositions. In a language communicated in the expression 'the human being is mortal' the quality of being mortal is the *uttered statement* or *predicate* (*ῥῆμα*). It can be applied to any human being for establishing a statement about the mortality of the particular human as a prediction. The concept of *ῥῆμα* for what is said shows that speech is an integral part of this kind of reasoning. The establishing of categories, *predicamenta*, is what Aristotle accomplished as the setting for the treatment of any knowledge by meaningful superstructures of logical processes. The relation between what is *the underlying* (*τὸ ὑποκείμενον*) and the actual thing can be interpreted as a contribution to the theory of modeling. This Aristotelian *underlying* and the establishment of categories can be structurally compared to basic features of the setting of *AI* modeling for predictions, for example, the parameters of values for datasets that are used for a specific prediction. Speech can be considered an important tool of means and the subject of logical

treatment in both approaches for the organization of knowledge. In our final discussion we will come back to this comparison.

3. Prediction and Predication as Concepts for Reasoning in a Communication Process Performed by Speech in the Theory of Rhetoric

For scholars and practitioners of rhetoric the product of their art is the artifice of speech (*λόγος*, *oratio*). After the death of Aristotle rhetoric continued to be taught by Greek scholars and became a part of the medieval liberal arts and humanities. The Greek term *τέχνη* and the Latin term *ars* were employed for the practice of rhetoric in the respective scholarly language. The practice of rhetoric comprises the rule-governed application of its theory, which is preserved in rhetorical handbooks. Quintilian in *Book I* of his *Institutio Oratoria* mentions for the early education of the rhetor that he intends to speak about the *crafts* (*artes*) a boy must have learned by training in order to become a speaker (*orator*). For the theory Quintilian employs the term *artificalia* in *Book I* (8.14.) for what follows the rules of this art with the formal elements *metaplasms* (*metaplasmi*), *schematisms* (*schematismi*) and *schemata* (*schemata*) produced so that the pupil is accustomed to the artificial things ("*sed ut commoneat artificialium*") by training with selected poems composed by poets who use a *meter* (*metrum*). In *Book V* Quintilian treats the inartificial proofs that are out of the range of rhetoric and the artificial proofs that employ signs, indications, evidence, appearances, and prognostics of a thing, argumentative forms like arguments and examples, and complex schemes of reasoning like the enthymeme, epicheireme, and syllogism. Indications, here called *εἰκότα* or *signa*, are probabilities that may or may not result in a conclusion (9.8.). Among the indications the *τεκμήρια* are the factual signs that cannot be implemented into the art of rhetoric due to the fact that they do not refer to the teachings of the art ("*pertinere ad praecepta artis*") (9.3.). Here Quintilian also mentions the distinction between insolvable facts and what is a part of the artificial area.

The theory of rhetoric considers speech realized as *logos* (*λόγος*) or *oratio* to be an immediate means and result of reasoning expressed in spoken language or writing that employs for its argumentation enthymemes and syllogisms and a topology for the finding of arguments. So technically new features of things can be established in the process of reasoning. At a linguistic level of terms of the theory the concept of prediction is present in the terminology of rhetoric: The Greek term *πρόρρησις* for a prediction is used as an *introductory statement of all saying* (*προρρήσεις ἐξ ἁπάντων τῶν εἰρημένων*) in a speech in Pseudo-Aristotle's *Rhetoric to Alexander.* It can be considered semantically to be the word for the same implicit conceptual meaning in both prediction and predication. But the actual use of these two concepts is specific to the disciplinary scholarly field. So in the discipline rhetoric the Latin term *praedictio* for prediction as a *premising statement* about what will be said in a speech is used by Quintilian in his *Institutio Oratoria* in *Book IX* (2.17.) among the speeches of the *genus iudicale* besides the *anticipation* (*praemunitio*), *confession* (*confessio*), and the *self-correction* (*emendatio*). In the theory of rhetoric a speech about the future is traditionally located in the *genre of deliberative speech* (*genus deliberativum*). Quintilian in *Book III* (4.7.) gives the example of the court as a place for speaking deliberatively about the future. Cicero uses the verb *praedicare* in his speeches, as in *Against Piso* (1.2.) in the statement "mihi ista licet de me vera cum gloria praedicare" expressing that it is appropriate to proclaim with true glory a self-praise. The beautiful life is to be glorified and praised ("beata vita glorianda et praedicanda est") is a phrase that Cicero employs in his fictional dialogues in Tusculaneum (5.17.50.). In the contributions to the theory of rhetoric by Pseudo-Aristotle and Quintilian the concept of prediction is present as a term for the anticipated part in a speech that introduces what will follow in the speech. The predictive function is in the theory of rhetoric described by the rule-based employment of argumentative schemes that are expressions via speech (*λόγος*).

Scholars employ models to show the effects of communication in a simulation. In the theory of

rhetoric it is usually the triangulation of *speech* (*λόγος* or *oratio*), the *speaker*, and the *audience.* The triangulation model of *message*, *sender,* and *receiver* of modern communication theories in the tradition of the *Mathematical Theory of Communication* written by Shannon and Weaver is an example of a theory of communication based on science for technology that reflects the treatment of electronic media in theoretical research in the early 20th century. Its components can be structurally traced to the Aristotelian model of rhetoric and its elements *speech*, *speaker*, and *audience*: Both these elements have the same functions: (1) serving as what is communicated, (2) initiating what is communicated, and (3) receiving what is communicated in the communication process. This mathematical theory is a model of modern technical communication but the old theory of rhetoric also employed a model in prescriptive treatises: Cicero presents a model of the *ideal orator* (*summus orator*) in his *Orator* as a projection without a historical reference. Cicero in *De Optimo Genere Oratorum* (1.1.) distinguishes between *genres of speakers* (*oratorum genera*) and states (1.3.) that the best speaker is the one who by speaking to the minds of the listeners teaches, brings joy, and moves ("*Optimus est enim orator qui dicendo animos audientium et docet et delectat et permove*"). In his *Orator* (2.7.) Cicero presents the *modeling* (*fingere*) of the *ideal orator* (*summus orator*) who never existed. This ideal orator could become reality with the prescriptions of rhetoric that Cicero unfolds. His own expression used for this modeling, the verb *fingere*, entails the meaning of fictionality for the description of his role model of an ideal orator. In *Orator* (17.55.) Cicero mentions that the *action* (*actio*) of the delivery of the speech consists of a kind of *eloquence of the body* ([*corporis*](#) [*eloquentia*](#)) of the *voice* ([*vox)*](#) and *motion* ([*motus*](#)). Cicero here (17.57.) also praises the *nature of the voice* (*natura vocis*) as *wonderful* (*mira*). As a kind of testimony Quintilian in *Book V* (7.36.) of his *Institutio Oratoria* treats the *voice* (*vox*) as means of an utterance caused by wine, sleep, or madness as well as oracles, prophecies, and omens. Quintilian mentions that the authority of such statements is what the orator needs to examine critically. Here the orator functions as the critical source for the judgement about such utterances in order to build his/her speech.

In the theory of rhetoric [*praedictio*](#) for prediction as a *premising statement* (as shown in Quintilian) and *praedicare* (as shown in Cicero) with the praising function of speech are terms for a genuine rhetorical use of the concepts of prediction and predication. The logical concept of predication is also entailed in the theory of rhetoric with the production of the enthymeme, epicheireme, and syllogism as well as the representational figures of speech. At the time the theory was developed in Greece the means and medium of these operations was speech as orally communicated performance and carrier of knowledge heard by the audience placed in front of the speaker. In later times rhetorical speech was transformed into representations in technical media. We will discuss this condition with the example of *AI*.

4. Criticism in the Humanities concerning Predictions Stemming from the Difference of the Predicted and Factuality of Things of the Real World

In the previous sections 2 and 3 we introduced and discussed the concepts of prediction and predication as employed by scholars who lived in a world before machine-based prediction became a substantial part of life and academic scholarship. Before we continue with the discussion of prediction as shaped in the world of the digital age in the following sections 5 to 7, in this section critical stances of post-Aristotelian philosophers on the distinction between the evidential empirical world and the technical world are presented as the support for the argumentation of our discourse. The following three examples of criticism concerning the limits of prediction refer respectively to the relation between the empirical and the non-empirical (Kant), the limitations of the actual features of a communicator of knowledge (Wittgenstein), and the problematic state of transfer of non-empirical processes into the empirical world (Popper). In all three cases the relation of the representation of the statement of the prediction and reality is not considered to be necessarily equal. In other words the validity of predicted knowledge in relation to reality is challenged by their criticism. So the criticism of prediction as a valid statement about reality emerges from the borders between factual

knowledge of the empirical world and the non-empirical result of a prediction. The statement can be proven only when held against a real existing state, e.g. an event in the future that comes into existence or does not come into existence.

A priori knowledge is in the tradition of Immanuel Kant the specific knowledge that is acquired independently of experience, while *a posteriori* knowledge derives from experience. In chapter IV *Of Judgement as a Faculty Legislating A Priori Deduction* of his *Critique of Judgement* Kant[11] mentions that a judgement that implies 'the particular' is *a priori*. This knowledge does not rely on experience as implied in the universal. Kant limits here 'the particular' to a thing that is judged by 'the universal' as an *a priori* knowledge that is non-empirical. It is possible due to conformity with the universal. What Kant here calls the judgement can be considered a statement that derives from the universality in 'the particular' and 'the universal', for example, a particular and a universal statement. The judgement is only possible under the condition of conformity between both. Applied to prediction this criticism concerns a model that requires universality suitable to make statements about particular cases, while it is not *vice versa* possible to reach the general from the particular cases.

Wittgenstein limits in the final conclusion of his *Tractatus Logico-Philosophicus*[12] the utterance of discourse as one option besides silence stating "7. *Whereof one cannot speak, thereof one must be silent.*" ("7. *Wovon man nicht sprechen kann, darüber muss man schweigen.*"). It is an either-or decision about speech use or no speech use. Another case of the limits of speech, the senseless use of speech, derives from the inquiry of the existence of concepts. So in 4.1274 the statement "*The question about the existence of a formal concept is senseless*" is exemplified with the senseless question "*Are there unanalysable subject-predicate propositions?*" No proposition can answer this question; a concept cannot be inquired or proven to exist or not exist as something purely representational that stems from the mental faculty. Statements derived from concepts cannot be verbalized. The criticism Wittgenstein exposes here refers to the discussion of the actual format of knowledge. The concept marks a border of the logical limitation of what can be said about a theoretical construct due to its limits concerning its reference to reality. This is a crucial condition for the application of conceptual representations as a proposition in reasoning processes or as data in computational processes in *AI* environments. For predictions this condition means that the actual concepts employed in a prediction, e.g. as parameters for values, cannot be considered as existing in the sense that they are references to reality and so any inquiry about them and their features is senseless.

Dialectics in the 19th century changed from the traditional description of formal rules of discoursing to a process that describes historical movements and also expands into the area of predictions about the future. This kind of interpretative description is practiced in the written accounts in the works of Marx and Engels. Popper[13] in *Conjectures and Refutations: The Growth of Scientific Knowledge* classifies dialectics as 'speculative philosophy' and criticizes Kant, the idealism of Hegel, and Marxist dialectics. For Popper "prophecy as such need not be unscientific, as predictions of eclipses and other astronomical events show. But Hegelian dialectic, or its materialistic version, cannot be accepted as a sound basis for scientific forecasts." Popper here criticizes the understanding of the prediction based on historical events that serve as foundation and means for the prediction of future events. On the contrary, the classical approaches of humanities in dialectics, logic, and rhetoric do not intend to make a transfer from one thing to another considering historical events suitable to continue under paradigmatic principles in the future. The criticism of the use of historical events in order to describe other events in the future as the prediction in a forecast of events is expressed by Popper. Popper draws a line between human actions and developments in societies that cannot be predicted vs. studies in natural sciences that may result in a weather forecast. Applied to predictions in the *AI* environment the criticism of this technology emerges here from the standpoint that events

of the future cannot be predicted based on structural applied principles, e.g. an algorithm.

The relation between the system of prediction and reality seems to be in any case a critical relation for a concrete prediction to become a true statement or in terms of speech an expression of speech that is equivalent to reality. The problem of this relation seems to lie in a particular semiotic feature. Lack of a compatibility that is made possible by equality or identity. The uniqueness of the human being including the ability to produce speech is an active factor for any changes that create new events. We use it here as *topos* of the description of the human condition. It is the human being who is *per se* equipped with a feature of unpredictability. It can be considered as an argument against any predictability of events that involve human actions. But from this *topos* specific features of the human being like the creativity that is needed in order to develop means and methods of predictions can also support predictability. The contemporary *AI* environments that mimic humans and intelligence in bots or robots ignore individuality and uniqueness relying on the character of a model that is used for calculations of datasets about events represented in speech as a unique expression of an individual person. *AI* applications for prediction are not presented as opinions of the respective industry. Such individualistic human features seem not to be not desirable in the industrial and professional applications of *AI.*

5. Prediction and Automated Computational Processes in *AI* Environments: Speech and Communication in Software for Data Analytics, in the Theory of Bayes (Bayes Theorem), and in Digital Humanities

Introduction to Prediction as Aim of Communication in *AI* Applications for Data Analytics and Speech
Contemporary predictive analytics employs [data mining](#) and processing, [statistical](#) techniques for data, [predictive modeling](#), and [machine learning](#) as training for a digital machine with data. It is practiced in a digital environment for computation processes of digitalized data. The algorithms of predictive analytics produce data that exceed previously given data as the representation of knowledge in resulting predictive data concerning the likelihood of events. The common *modus operandi* for an *AI* prediction in an automated digital environment is usually the execution of an algorithm.

Commonly used techniques with algorithms for predictive modeling in machine learning also include other algorithms besides Bayesian analysis with the respective *Naïve-Bayes* algorithm for the calculation of the probability that an event occurs. Widely known and used are the algorithms of classification models, the algorithms of regression models, and the algorithms of assembling like the *Random Forest* algorithm as supervised learning algorithms with a defined variable of the output in contrast to unsupervised learning algorithms. The software for predictive analytics predicts with the *Naïve-Bayes* algorithm what is likely to happen based on given data with predefined variables/features. This is one example of concrete predictions in *AI* that are the output of an algorithm, which has been used in a historical dataset that serves the model and is applied to new data presenting the likelihood of a specific predictive event. Data can be either structured data, e.g. an organized set of data, or unstructured data, e.g. a written text. A dataset that can undergo an algorithmic process consists of several variables or features that are categorized data collected for particular cases arranged in a listing format. When applied to prediction processes, the variables, which constitute the input, are also called predictors and determine the output of the model. The actual prediction is a data value presented in the format of the input variables. The communication in *AI* applications that implements algorithms for prediction is an organizational process from the state of the input to the stage of the output, whereas the actual predicted result depends on the chosen algorithm. Even the implementation of this process into an application, e.g. a bot, can be additionally considered a part of the communication process between a human being and a machine.

It is quite interesting to look at the relation between speech and data in *AI*: Data can be organized in words arranged as structured or unstructured data. So the speech as graphically and digitally encoded text can undergo the process of prediction in *AI*. This concerns any unit of natural speech or rhetorical speech that enters as input from the real world the computational system. But what about the claim that speech produced by an *AI* application is the function of this specific intelligence? We will in the following sequences look at the theory of *AI* before we discuss this question*.*

A Problem of Evidence – From Prediction to Speculative Statement of the World:
The Case of the *Bayes Theorem* as Method of Computational Modeling
For the problematic relation between the factual world and its events and the attempt of prediction in *AI* environments we demonstrate the relation between theory and practical applications in the case of the application of the theorem recorded by Bayes (*Bayes Theorem*) in the related algorithm. In *AI* environments it is common practice to employ a model of reality that operates with such algorithms. In the theory described by Bayes the concept of prediction is used for calculating the statistical probability of the occurrence of data, e.g. a statement or event A based on previous data, e.g. statement or event B. *Bayes Theorem* for the probability of A expressed in the equation $P(A|B) = P(B|A) P(A) / P(B)$ is a theoretical approach to calculate the probability for predictions for A (we can call the *generated new statement or event*) based on the division of the product of the likelihood of B (we can call *the old known event or statement*) in the case that A is true by evidence ($P(B)$). This theory has applications in machine learning. Piironen and Vehtari[14] showed that various Bayesian predictive methods for models exist in statistical computing. The expression *Bayesian reasoning* is used in the contemporary scholarly interpretation of Bayesian calculation like in the lecture notes of Hertzmann.[15] Applicable to models used in machine learning Hertzmann[16] defines probability theory as "a quantitative expression of common-sense reasoning" and associates the theorem $P(A, B) = P(A|B)P(B)$ to it. Hertzmann[17] mentions that the method of replacing other methods that result in a single estimate θ ignores its own uncertainty of making predictions by taking such uncertainty into account and is called 'Bayesian prediction'. 'Bayes' Rule' for predictions of a probability model $p(data|model)$ Hertzmann[18] describes in the equation $p(model|data) = p(data|model) p(model) / p(data)$. Here $p(model|data)$ is the *posterior* that results from the multiplication product of the *likelihood* $P(data|model)$ and the *prior* $p(model)$ that is divided by the *evidence* $p(data)$.

We discuss now the relation between model and world in *AI* applications. In the application of the theory developed by Bayes the obtained statement or event refers to a specific contextual system, the model and its data. The obtained statement or event, also represented in data, can be used and implemented into the overarching system the prediction is finally applied to, the world. This is a process that occurs when results from machine learning are applied to situations in the world with this assumption that the prediction is a true statement and accepted as true knowledge for a situation that exists in the world, even though it entails a mathematical expression of its likelihood. The *Naïve-Bayes* algorithm in machine learning makes predictions based on the classification of two or more datasets of a model. Let us now in a thought experiment equalize these data with speech, for example, datasets that contain words are common in *AI*. In applications of the Bayesian theorem a prediction about speech that is about to be realized, A, is based on previous probability stemming from the speech data of the model, B. The prediction of probability with *Bayes' Theorem* is one way of prediction that can be practiced in *AI* environments for the production of artificial speech generated as A including the indication of the likelihood. The choice of the likelihood of an event in a communication process, e.g. the choice of a particular speech sequence of words in accordance with previous data can be selected from the modeled *AI* environment based on the data that are available from the model in order to decide in a particular case what A is.

At the point where the prediction of likelihood is taken as a means of an action –for instance a

statement in a speech that is presented with a claim of reference to reality– the prediction is conveyed into a speculative action. It lets what is predicted as a statement of calculated interference enter the real world. In how far the data that resulted in the prediction as speculative action can be grounds for the claim of evidence as factual knowledge in the real world is the actual problematic state of the method of *AI*-based prediction. The available datasets are limited in contrast to information in the factual world of reality. In *Bayes' Theorem* evidence is understood as supporting data (B) for the hypothetical assumption of truthfulness of what is to be predicted (A). The concept of evidence refers in this theory to the model. Evidence, generally understood, refers to empirical and factual information in the world that needs no further argumentation. In the theory of rhetoric evidence is as *energeia* a figure of speech used in the presentation of the speech for a vividly represented reality that imitates what the eyes see for the audience. Quintilian writes in the *Institutio Oratoria* (6.2.32.) that *enargeia* [sic] emerges from impressions using it as his term that is equivalent to *inlustratio* and *evidentia* in the work of Cicero. The term can be traced to *energeia* (ἐνέργεια) in the Aristotelian corpus that is here usually translated and understood as the quality of *actuality.*

What about the relation between reality and speech in the *AI* environments? Can we accept the format of datasets in *AI* environments as a fact or is it only a loose reference to reality? This is an underlying question concerning knowledge that can be answered from different perspectives ranging from 'yes, datasets in *AI* are evidential facts' to 'no, datasets in *AI* are not identical with facts of reality'. In terms of Aristotelian logic the truthfulness of the *uttered statement* (ῥῆμα) here challenges *AI* calculations with predictions, especially if they entail probability, when a vague meaning lacks evidence and a reference to reality that is produced with an implicit likelihood. *AI* calculations that turn out to be predictions for the world are produced inside the model. Priority of factual events and posteriority of hypothetical events with a specific likelihood are features of the prediction calculable as outcome of the event A with predictor variables of the given B. The output is not an *uttered statement* (ῥῆμα) of the speech as *λόγος* but the result of a mathematical computation with uncertainty expressed as likelihood. With the underlying computational processes a lack of evidence (in the sense of rhetoric as an approach of the humanities) exists within the system of *AI* and computation. On the contrary, the orator brings evidence as a rhetorical stylistic means in the speech or *λόγος* that cannot be produced in an artificial environment. Our segmentation 'world vs. *AI*' allows a microscopic focus suitable for the criticism of the use of such kind of prediction that we exemplify with speech of a prediction. In the following part we will look at the macroscopic perspective for *AI* predictions as a part of the human world.

The Use of Speech – From Traditional Humanities to Digital Humanities: Prediction and Predication in Computational *AI* Environments

Even though it was not called prediction in the respective ancient works, the traditional humanities refer to prediction by reasoning as an implicit feature of a thing obtainable in processes of logic, dialectics, and rhetoric that is communicable as an uttered proposition emerging from an organized performance of the mind. It is usually uttered in a communication process performed by natural speech or with a symbolic system. The recent approach of humanities studies called digital humanities also employs approaches of predictive analytics supported by automated mathematical computation and *AI* modeling. One study of historical data that undergo an algorithmic process coined as '*predicting the past*' is described by Blanke[19] for a study of genders in a group of historical persons, vagrants in England whose data are arranged in datasets in *Python.* Blake explains that "predicting the past is introduced as a method examining datasets about the past using machine learning." The prediction refers here only to the exploration of the likelihood that besides the feature of the name, the historical value, other features in the datasets exist. Classification (based on a dictionary) and rule-based prediction (based on logical rules) were conducted by the model in order to determine the gender of the persons based on their given names as non-numerical

data in natural speech. The output of the gender attribution including wrong gender attributions for both methods was finally evaluated in comparison with the actual gender. This study is an example, in which knowledge is arranged in datasets organized by categories for features and attached values (linguistics data of a person, type of vagrant, year, location, historical contributor of data, and a historical source of reference) for each particular person. Without *AI* computation the prediction process for genders can also be done by relatively unskilled humans determining the gender based on the forename. Such prediction in *AI* environments in digital humanities marks for sure a break in the tradition of the conceptualization of predictive results done by methods of reasoning due to *AI* automation. We showed previously that the prediction is an overarching concept for a reason-based mode in the humanities by the rules of the *trivium* of grammar, rhetoric, and dialectics or logic and in philosophy. This mode is applied to things that are communicated in speech in order to make statements that derive from the subject and are treated as part of communication processes in natural speech, e.g. a syllogism, or with symbols of logic.

At this point we continue our discussion with a closer look at the Aristotelian concepts for the discussion of predication in *AI* environments. Data-driven research of digital technologies, the use of software and apps for specific tasks, and content production in digital environments that entail *AI* are approaches to establish and use a prediction; this prediction serves a communicative function in the conceptual and technical framework of computational environments. Let us describe the speech in *AI* environments in an analogy to show similarities: In a dataset employed for a model of predictions we can structurally compare the Aristotelian *subject/name* (ὄνομα) with the data entry for an independent variable and the dependent variables or features with the ῥῆμα associated to this subject. Datasets employed for predictions by computational algorithms consist of more than one entry of a variable/*uttered statement* (ῥῆμα). In *AI* predictions we can describe the datasets as input for algorithms in basic Aristotelian terms organized in chains consisting of a single *name* (ὄνομα) and associated datasets as variables for what is a *predicate* or *uttered statement* (ῥῆμα). A *predicate* or *uttered statement* (ῥῆμα) must match a particular category. One category is the variable of the output that is usually identical with one of the variables of the input. This description is actually not only an analogy; it entails a comparison of the structural similarity of rhetorical practice and the way *AI* performance treats its contents described with computational logical terms and the conceptual framework of the Aristotelian philosophy. In a rhetorical syllogism datasets of speech are also implicitly organized. They may stem from categories like the ones developed in the respective treatise by Aristotle, but they can also stem from categories that a speaker chooses. This process is similar to *AI* for data in a dataset as the organizational structures for the representation of given knowledge that shapes the derived knowledge. Here the overarching categories must be identical in model and training data or any new dataset of the predicted knowledge. We can compare the relation of new and old datasets with the premises and the conclusion of the syllogism in traditional Aristotelian logic and rhetoric in terms of their matching underlying categories. The question that emerges here is if traditional humanities do not refrain from using predictive methods similar to *AI* as their own established methods in their choice of matching categories. To reduce their methods to mathematical operations with data that replace the playful relations between mind, thing, and words explored in the humanities is what currently is practiced in cases of digital humanities like the one we introduced in the oxymoron '*predicting the past*', while in the traditional humanities no calculations as a part of the communication process are performed.

6. Cases of Applications of Prediction in *AI* Environments: Communication Processes with Voice and Speech in Man-Machine Interactions

In how far is prediction of speech an inherent element of *AI* applications designed for man-machine interaction as a communication process? On the one hand, this question concerns the process of receiving natural language as the speech of the human being –a developer, a trainer of the model in machine learning, or a user of an application are examples– and its use as data in *AI* applications. On

the other hand, this question refers to the production of representations of natural language as quasi-human speech or mediated speech outside the human body, e.g. in written speech or in an *AI* environment as a way of the communication process for the information. *Natural Language Processing* (*NLP*) is a specific purpose-driven *AI* branch for digital tools that concerns communication processes with speech processed and performed as natural speech in an exchange between human and machine in machine-learning environments. The question *[What is Natural Language Processing?](#)* IBM[20] answers explaining that it "refers to the branch of computer science—and more specifically, the branch of artificial intelligence or AI—concerned with giving computers the ability to understand text and spoken words in much the same way human beings can." The distinction concerning the borders between natural speech and artificial speech in *AI* environments can be described as transient. Natural speech of a natural language can be transformed into artificial speech in the sense of a change of its environment from a human being to a machine in various ways; a transcription of a written text or a sound recording are examples. But this process is only possible in one direction, from natural speech to artificial speech. It is not vice versa possible to convey artificial speech as output of a system into natural language (except when the human being interprets the actual output, e.g. by reading aloud the text displayed by a chatbot). Artificial speech is here simply neither produced nor communicated by a human as a bodily entity with a mental faculty, even though it may look like natural speech.

Software, apps, and platforms with *AI* components are places in the digital environment for the development of any application for *Natural Language Processing*. All of them are digitally represented, operating, and communicating. Such a hermetic environment allows no exchange with the world outside itself except for the initializing, manipulation, or obtaining of data by an entity outside the system; an example is a person who interacts with such processes. The digital environment is an example of a system that has some access points for man-machine interaction, most obviously the interface of the application displayed on a computer screen. In the digital environment we can distinguish two types of technology that employ *AI* for speech in a communication process in man-machine interactions:

(1) Interactive and executive *AI* for man-machine interaction

that employs speech for interaction

(2) Predictive *AI* for the evaluation of speech in text corpora

From a macroscopic perspective we could also add *AI* as a communicative means that communicates speech with its own ability to interact without the difference 'world vs. *AI* environment'. But here we look at the cases of concrete contemporary *AI* applications.

Interactive and executive *AI* for man-machine interaction via speech in a communication process is employed by bots that represent by mimicking speech the data obtained from their digital infrastructure as information displayed on the screen after a stimulus from natural speech by the user has reached the bot. In such interactive and executive *AI* the simulation of human features in speech is often employed, e.g. in business software interacting with customers presented as a human-like entity on the computer screen. This man-machine interaction is present in a dialogue with an active processing of human speech as input and/or responses of the machine for a representation of human speech. Platform bots are chatbots implemented on websites for users and ready to perform such dialogue. The chatbots of websites are trained to communicate with visitors of the site concerning the specific services or products that the website offers. These chatbots also provide auxiliary functions for their users. An example of a platform service that supports such business-oriented chatbots for the online presence of companies is *Chatboxcreator*, which offers the option to automate answers based on the submitted keywords of users. Personal assistant apps aim

at providing personal services mimicking human features and with access to the digital data of the user, for example, the interface of such an application can have human traits on the screen of a personal computer. *Braina* is an artificial intelligence software for an automated personal assistant that allows the user interactions by voice or written commands in order to initiate operations through the interface. Equipped with voice recognition software *Braina* can retrieve digital data for the user that are supposed to be true as knowledge of the real world helping the user in his/her workflow. Bots are available as implementations of public social media for the community of the users of the respective social media. An example of the integration of a chatbot into a social media app is the recent case of the *WHO.* In 2020 a chatbot was implemented into the social media environment of *WhatsApp* called *WHO Health Alert* together with the *WhatsApp Coronavirus Information Hub* linked to the location whatsapp.com/coronavirus. The undesired use of bots as strategic manipulative means for the dispersion of information in social media platforms by particular interest groups that use the social media for their specific and often deceptive purposes is a phenomenon that commonly occurs in the short-message service *Twitter.* The distribution of different types of content that can be delivered as bulk messages, fake information, or manipulative contents is here caused by automatically operating accounts that look like *Twitter* accounts of humans and communicate messages to the accounts of humans. Personal entertainment bots like *Cleverbot* serve as a replacement for human activities of socialization and aim at an interactive experience between the user and the bot that imitates human-to-human communication via conversational speech. Prediction is here the ability to imitate human behavior as a part of the communication process in a dialogue with linguistic modes of human speech that is present as voice or text. Chatting is a mode of conversation that has become a fashionable way of human conversation supported by digital media and man-machine interaction via natural speech-processing. This mode of chatting can be traced to one way of speaking among the variety of communicative modes of speech that are preserved in the ancient Greek language. Here the term *lalia* ([*λαλιά*](#)) as an informal conversation was employed for speech that can be distinguished from oratory speech as *logos* (*λόγος*).

Predictive *AI* for the analysis of text corpora like *Presage* and writing assistants produce comments for a given text in a natural language by the comparison of texts or by suggesting improved versions of a text. Man-machine interaction represents a communication process that establishes a mode of feedback for the input, the text of a linguistic unit that is supposed to be examined. The resulting predictions aim at being recommendations for improvements or corrections of the submitted text. *Presage* is a predictive text entry platform that produces text based on modeling natural language coming from redundant information sources. *Presage* computes with predictive algorithms for the analysis of natural speech the probabilities for words that are most likely to occur next in a given text. *MeaningCloud* is a text analytics tool that extracts meaning representing it in the format of topics, text structures, or grammatical features from the input of unstructured content like documents, articles, conversational chat in social media, or web content. Writing assistants like *Grammarly* allow the assessment of a text in natural language by screening it against its internal data in order to show grammatical and stylistic suggestions for corrections of text parts that do not match the rules of the internal data. Here the difference of data emerging from the predictive function is obvious in the contrast of the error-containing input text vs. the error-free text as the potential output. The suggested corrections themselves can be errors that stem from the limit of the knowledge of the system. From a broader perspective a prediction in such applications takes place as a statement about an event that is made within a hermetic environment – the data available in digital formats (like a text corpus of natural speech in an *AI* application)– in order to make the predictive statements about the real world (the given linguistic text).

We conclude this part with a comparison of the initial elaborations on *logos*-driven speech and speech in *AI*: Data available in the digital format are employed to make such statements based on

available digital data and/or imitate human features in the communication process between human and machine. The digital format of data and modes of operations are localized in a hermetic space that limits the discourse itself, the representation and processing of speech, and the application for speech. In this hermetic environment speech is analyzed, manipulated, or produced with limited operations of the data. Speech is here neither the utterance of a human oral speech nor an *uttered statement* (ῥῆμα) of a reasoning process of the human mind present. Expressed with a likelihood speech as output can even formally not be considered to be factually true.

7. Closing the Argument: A Final Discussion of Communication of Speech in the Case of Prediction in Traditional Humanities vs. *AI* Computation

The concept of *mimesis*, broadly defined as a representation of a product of art or nature in another art, can be considered useful for the critical assessment of the existing or outstanding intended features of *AI* as a computation in contrast to a reasoning process in the case of speech. As re-interpretation of an artifice or nature in another artifice Aristotle in his *Poetics* (1447a) employs this concept for flute-playing and harp-playing as sounds in drama and poetry. In contrast to the concept of *mimesis* as a feature of the artifice *AI* claims to imitate and even exceed as an alternative the human abilities and practices stemming from the mind and the articulation of human speech in sounds. Elson[21] defines this framing as "the notion that a computer can imitate or emulate the thought processes of a human and demonstrate intelligence through action." The technology of *AI* for prediction comes with an armada of metaphors related to the human features in expressions like *artificial intelligence*, *machine learning*, *deep learning*, and *neural networks* for its predictions that communicate their intended meaning in a self-declaring way in their names. But is it just mimicking of human processes, e.g. cognition in the simple sense of copying, a promotion and alternative, or nothing else but what we already in traditional ways see, know, and speak about in order to obtain knowledge? What is traditionally defined as the propositions of the mind and their expressions in the speech of humans could be simply explained as simulated reality, a human-made device operating in between two areas, or the continuation of the real world. In any case its legitimate aim seems to be the same. It is obtaining and communicating knowledge.

Gaining knowledge about the relation between words, thoughts, and things is a traditional purpose of the humanities. Scholars like Aristotle described its conditions. In the theory of rhetoric things are considered to be the pragmatic outcomes reached through the persuasion inherent in speech. For the effect of persuasion its patterns are structures of the speech style that are composed in accordance with the rules of the theory of rhetoric. These structural features make such a speech an artifice in contrast to speech as the performance of communication in natural language stemming from the mere human ability to speak. A way to illustrate the theory of rhetoric can be like in Cicero's *Orator* the presentation of a perfect model of a rhetorically skilled speaker. Natural language performed as speech also complies with the rules for grammar as the framework of its structures. In computational processes algorithms in *AI* environments can explore patterns in given datasets and can be applied to produce data that are turned into predictions. If prediction as a statement represented in symbolic means cannot be identical with an event in reality, it is (even when considered to be true) a statement with a likelihood of being true as a statement of reality ranging from 0 (= *untrue*) to 1 (= *true*). For example, in the case of a chatbot that communicates text made from a natural language in an exchange with a human being, the likelihood of the artificial speech to match natural speech of a human is reflected in its imitative approach to mimic human behavior in the hermetic environment. Its output is applicable to the world with the above-mentioned range of potential identity. Its poles as a true representation of the world or the opposite open the spectrum of non-evidential likelihood. This prediction is limited due to a lack of real-world experience with a virtually endless variety of obtainable data that is compensated by the selection of the model in the production process of a conditionalized output results from the computational data available in *AI* processes.

A computation of the likelihood for the realization of a particular statement/event of artificial speech performed by a model that mimics a human being involves a speculative act of its performance in the environment of the computation. We discussed and compared it with an actual performance in natural speech and reasoning of a real human being in the previous parts. We also showed with examples that communication modes of natural and artificial speech can be distinguished based on the source of origin (reality or a hermetic digital environment). Applied to speech in *AI* such criteria like the generation of a grammatically ruled unit of spoken or written language represented in the digital environment, natural speech can be considered identical with artificial speech; a human being and a chatbot can produce the same sentence. But the environment is still different. If the source of speech is a human being, the linguistic ability also comprises pragmatic non-linguistic experiences and linguistic experiences that are not available in a limited format (like an *AI* dataset). The machine has no access to empirical linguistic and non-linguistic experiences and handles data in a formalized way (algorithm) and in a variety of limited mediated communication processes as statements with a reference to the outside world. On the contrary, Aristotelian reasoning takes into account that the voice is a means to establish meaning. We can also add to this human feature the unpredictable features that come from the human condition, while computational approaches with *AI* lack this feature.

The concept of prediction as a process and concrete representation of statements about the world entails a variety of applications in scientific theories beyond the Aristotelian philosophy and its continuation in the humanities. The computational approaches of data science reduce the concept of prediction to a mathematical computation of selected features. We can also argue that mathematical precision for the prediction and communication process lacks or is only to a certain degree present in the speech of a human being. Even with an articulated speech as a carrier of knowledge, which is present in the approach of reasoning since Aristotle used the concept of *ῥῆμα* for its utterance, a mathematical precision cannot be achieved. So an identity or equality of words and things cannot be obtained. An approach to obtaining knowledge, when considered to have a limited human realization of the *logos* (*λόγος*), can also be characterized as a way towards what actually unfolds a full meaning across speech and reasoning beyond computation and reckoning. When the power of voicing out a meaning appears to be unlimited and when we exceed the conceptual framework of the *logos* (*λόγος*) (or any other super-force as the cause of the impact on and behind it), we do not need a differentiation of speech concerning its origin, place, and form. Such an indifference of this position brings ubiquity of the features to speech. But speech seems not equally present and realized, when we face the past and present situation, in which as an uttered realization of reasoning speech is discontinued in modern theoretical disciplines like logic and mathematics. At the point where it is not present as a unit of the human in natural speech it is reduced to a technique of the representation of computation.

In a previous section we showed that the establishment of categories, the Aristotelian *predicamenta*, is in Aristotelian philosophy the framing organization of any knowledge by meaningful superstructures for its logical treatment. It can be structurally compared to a basic feature of *AI* modeling for predictions. Here the chosen parameters of values for datasets are present in the design for the collection of the respective data. An example is a csv file with a set of ten parameters, e.g. the ten categories that Aristotle used or any other categories. The associated data can be collected for each parameter and used for the model in order to make predictions with an algorithm. Aristotle presented by these categories and the concept of *the underlying*, *τὸ ὑποκείμενον*, for the prediction in his *Categories* a specific topological structure of the organization of anything including speech that can be treated for obtainable knowledge.

A machine-based prediction that *AI* offers as the continuation of the human *λόγος* might be considered as a continuation of the *λόγος*. But the tendency of an automated process of the

organization of information that is separated from the empirical world is currently obvious in related applications of *AI*. We discussed some cases in theory and with examples of applications for this difference in the case of speech. A justification for the claim that machine learning and *AI* are not operating logically as predictions and comparable to the logic of the human mind stems from the topology of the places of knowledge. These places were considered different in both cases in our discourse; *AI* is organized in a non-human environment we characterized as hermetic. Let's call it the mechanical environment for any technical area, which is hermetically closed and technically operating, while the mind as a human organ is embodied and does not function without the human body and other organs, most evidentially in its connection with the senses of esthetic perception and the vocal tract. As a tool it is human-made, as a tool it can also be considered to be used in a wrong way, as a tool it can be seen as a means of speech. But as a tool it also should cautiously be represented as a human being or with qualities equivalent to a human being in the framing of *AI* and its use for life.

Let us look at the human being, human abilities, and conditions of human existence. It is needless to say that the voice as an expression of a bodily organ cannot predict the future; but it articulates itself within the given framework of the human existence and may even foretell in this way the future, even though this practice can turn out as false in the light of the actual events; it is unbound. *AI* cannot do that; it is bound to data in the digital format and environment. The difference between prediction and predication may help here to come to a conclusion. Prediction is as foretelling a general concept widely used in vernacular languages and jargon, while predication is a purely logical concept used in the branch of logic originally housed in philosophy and areas that emerge from it. Predication seems to match more with predication as coined for *AI* in order to describe such a computational process. It is necessary to take both concepts into account for treating *AI* in a discourse in order to understand that the claim of prediction in *AI* is a specific one. It is neither predication of logic nor saying something about a thing before it actually happens. It is a mathematical calculation in a mechanical digital environment and its limits of truthfulness. We may call this hypothetical or speculative speech located between true and false, real and unreal, black and white.

We take here a conservative approach to concepts deemed important in order to discuss speech starting with the ancient Greek philosophy of Aristotle. Of course, a universal and authoritative continuity of a stable meaning of concepts like prediction cannot be guaranteed or considered acceptable as a universal truth. Nevertheless, the continuity of ancient concepts as meaningful means of interpretation is legitimate, if not necessary or desirable in order to understand the human existence. Foretelling the future was and is a practical use of prediction by some practitioners from different professions, e.g. in speculative thinking and prophecy, but also in mathematical calculations. The fact that prediction has become an application of *AI* is reflected in the current critical state of awareness of the world in the 21st century with raising concerns among critics concerning this contemporary technology embedded in various branches of modern life in digital architectures.

The claim of human-likeness of *AI* in its own terminology – comparing it as a type of intelligence with the human intellect of the mind – is an aspect of a controversial issue in light of the different environments of both types of operations. The human mind is embedded in the world a person lives in and exists with the unpredictability of how human mental processes and operations actually work in light of their openness to other sources of perceivable information. We still put it in contrast to prediction in *AI* that depends on a limited space. Even in the term *artificial intelligence* the notion of limitation is embedded. The position of the universal continuity of the creativity of the human intellect in the digital environment serves as a place for an argument of speech in *AI* applications as equally featured and identical with speech in natural language. But that claim is hard to hold taking

into account the state of limited performance of speech produced in the digital environment compared to what a real speaker – not necessarily an orator – can perceive, think about, express in speech, and actually do. Currently, a predictive quality as imitation, emulation, or simulation of human behavior is what seems to be the matching meaning associated with the concept of prediction in *AI*.

Returning to the raised question *Is AI-empowered speech a form of reliable knowledge?* we can conclude that the origin of the data and the assessment of the human being as the source of this kind of knowledge actually shapes the degree to which it is an extension of reality and – spoken in the Aristotelian terminology – the *λόγος*-based performance of speech or not. When we attribute the collection and processing of such data and even the design of the *AI* environment as an act of creativity to the human being or a power behind this human being and the human conditions for life, its reliability in this framework is the same as the other statements or events that speech can evoke. But if we draw the line between the world as reality and the modeled world of *AI* predictions, the modes of what can be uttered are quite different for both. *AI*-empowered prediction is like the type of speech that Aristotle calls prayer located in an area beyond the true and the false.

Digital Tools and Software

Braina. Https://www.brainasoft.com/braina/
Chatboxcreator. Https://chatbotcreator.online/#platform
Cleverbot. Https://www.cleverbot.com/
Grammarly. Https://www.grammarly.com
MeaningCloud. Https://www.meaningcloud.com/
Presage. Https://presage.sourceforge.io/download/
WhatsApp. WhatsApp Coronavirus Information Hub.
Https://www.whatsapp.com/coronavirus/who/?lang=en and hatsapp.com/coronavirus

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[16] Ibidem, p. 19.

[17] Ibidem, p. 32.

[18] Ibidem, p. 29.

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