

## Full Stack Deep Learning - March 2019

### Handwriting Data Collection

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Borrowing from the management literature, Kaplan and Haenlein classify artificial intelligence into three different types of AI systems: analytical, human-inspired, and humanized artificial intelligence. Analytical AI has only characteristics consistent with cognitive intelligence; generating a cognitive representation of the world and using learning based on past experience to inform future decisions. Human-inspired AI has elements from cognitive and emotional intelligence; understanding human emotions, in addition to cognitive elements, and considering them in their decision making.

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When the data source has a lower-probability value (i.e., when a low-probability event occurs), the event carries more "information" ("surprisal") than when the source data has a higher-probability value. The amount of information conveyed by each event defined in this way becomes a random variable whose expected value is the information entropy. Generally, entropy refers to disorder or uncertainty, and the definition of entropy used in information theory is directly analogous to the definition used in statistical thermodynamics.

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Information is the resolution of uncertainty; it is that which answers the question of "what an entity is" and is thus that which specifies the nature of that entity, as well as the essentiality of its properties. Information is associated with data and knowledge, as data is meaningful information and represents the values attributed to parameters, and knowledge signifies understanding of an abstract or concrete concept.

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Gradient descent is a first-order iterative optimization algorithm for finding the minimum of a function. To find a local minimum of a function using gradient descent, one takes steps proportional to the negative of the gradient (or approximate gradient) of the function at the current point. If, instead, one takes steps proportional to the positive of the gradient, one approaches a local maximum of that function; the procedure is then known as gradient ascent.

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# Full Stack Deep Learning - March 2019

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Deep learning (also known as deep structured learning or hierarchical learning) is part of a broader family of machine learning methods based on learning data representations, as opposed to task-specific algorithms. Learning can be supervised, semi-supervised or unsupervised. Deep learning architectures such as deep neural networks, deep belief networks and recurrent neural networks have been applied to fields including computer vision, speech recognition, natural language processing, and audio recognition.

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Deep learning (also known as deep structured learning or hierarchical learning) is part of a broader family of machine learning methods based on learning data representations, as opposed to task-specific algorithms. Learning can be supervised, semi-supervised or unsupervised. Deep networks have been applied to fields including computer vision, speech recognition, natural language processing, and audio recognition.

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Gradient descent is a first-order iterative optimization algorithm for finding the minimum of a function. To find a local minimum of a function using gradient descent, one takes steps proportional to the negative of the gradient (or approximate gradient) of the function at the current point. If, instead, one takes steps proportional to the positive of the gradient, one approaches a local maximum of that function; the procedure is then known as gradient ascent.

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When the data source has a lower-probability value (i.e., when a low-probability event occurs), the event carries more "information" ("surprisal") than when the source data has a higher-probability value. The amount of information conveyed by each event defined in this way becomes a random variable whose expected value is the information entropy. Generally, entropy refers to disorder or uncertainty, and the definition of entropy used in information theory is directly analogous to the definition used in statistical thermodynamics.

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Information is the resolution of uncertainty; it is that which answers the question of "what an entity is" and is thus that which specifies the nature of that entity, as well as the essentiality of its properties. Information is associated with data and knowledge, as data is meaningful information and represents the values attributed to parameters, and knowledge signifies understanding of an abstract or concrete concept.

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# Full Stack Deep Learning - March 2019

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From the technology perspective, speech recognition has a long history with several waves of major innovations. Most recently, the field has benefitted from advances in deep learning and big data. The advances are evidenced not only by the surge of academic papers published in the field, but more importantly by the worldwide industry adoption of a variety of deep learning methods in designing and deploying speech recognition systems.

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When the data source has a lower-probability value (i.e., when a low-probability event occurs), the event carries more "information" ("surprisal") than when the source data has a higher-probability value. The amount of information conveyed by each event defined in this way becomes a random variable whose expected value is the information entropy. Generally, entropy refers to disorder or uncertainty, and the definition of entropy used in information theory is directly analogous to the definition used in statistical thermodynamics.

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Gradient descent is a first-order iterative optimization algorithm for finding the minimum of a function. To find a local minimum of a function using gradient descent, one takes steps proportional to the negative of the gradient (or approximate gradient) of the function at the current point. If, instead, one takes steps proportional to the positive of the gradient, one approaches a local maximum of that function; the procedure is then known as gradient ascent.

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Mathematicians seek and use patterns to formulate new conjectures; they resolve the truth or falsity of conjectures by mathematical proof. When mathematical structures are good models of real phenomena, then mathematical reasoning can provide insight or predictions about nature. Through the use of abstraction and logic, mathematics developed from counting, calculation, measurement, and the systematic study of the shapes and motions of physical objects.

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Computer science is the study of processes that interact with data and that can be represented as data in the form of programs. It enables the use of algorithms to manipulate, store, and communicate digital information. A computer scientist studies the theory of computation and the practice of designing software systems. Its fields can be divided into theoretical and practical disciplines. Computational complexity theory is highly abstract, while computer graphics emphasizes real-world applications.

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There are so many interesting problems to work on. How do you pick the one to focus on right now? There is no clear-cut answer, yet some good rules of thumb apply. For instance, consider Impact/Feasibility framework. You always want to be working on high impact and high feasibility problems.

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Thus a neural network is either a biological neural network, made up of real biological neurons, or an artificial neural network, for solving artificial intelligence (AI) problems. The connections of the biological neuron are modeled as weights. A positive weight reflects an excitatory connection, while negative values mean inhibitory connections.

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Information is the resolution of uncertainty; it is that which answers the question of "what an entity is" and is thus that which specifies the nature of that entity, as well as the essentiality of its properties. Information is associated with data and knowledge, as data is meaningful information and represents the values attributed to parameters, and knowledge signifies understanding of an abstract or concrete concept.

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When the data source has a lower-probability value (i.e., when a low-probability event occurs), the event carries more "information" ("surprisal") than when the source data has a higher-probability value. The amount of information conveyed by each event defined in this way becomes a random variable whose expected value is the information entropy. Generally, entropy refers to disorder or uncertainty, and the definition of entropy used in information theory is directly analogous to the definition used in statistical thermodynamics.

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Natural language processing (NLP) is a subfield of computer science, information engineering, and artificial intelligence concerned with the interactions between computers and human (natural) languages, in particular how to program computers to process and analyze large amounts of natural language data. Challenges in natural language processing frequently involve speech recognition, natural language understanding, and natural language generation.

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Mathematical analysis is the branch of mathematics dealing with limits and related theories, such as differentiation, integration, measure, infinite series, and analytic functions. These theories are usually studied in the context of real and complex numbers and functions. Analysis evolved from calculus, which involves the elementary concepts and techniques of analysis.

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Borrowing from the management literature, Kaplan and Haenlein classify artificial intelligence into three different types of AI systems: analytical, human-inspired, and humanized artificial intelligence. Analytical AI has only characteristics consistent with cognitive intelligence; generating a cognitive representation of the world and using learning based on past experience to inform future decisions. Human-inspired AI has elements from cognitive and emotional intelligence; understanding human emotions, in addition to cognitive elements, and considering them in their decision making.

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