Learning document

W = You have to know What it is
E = you have to be able to give an Example
P = you have to understand multiple steps in the Process

Information

- (Week 1-7) Feature (W, E)
- (Week 1-7) Object (W, E)
- (Week 1-7) Classes (W, E)
- (Week 1) Information system (W)
- (Week 3) Artificial Intelligence (W)
- (Week 3) Machine learning (W, E)
- (Week 3) Speech recognition (W, P)
- (Week 3) Writing recognition (W, P)
- (Week 3) Problem of opaqueness in AI (W)
- (Week 4) Deep learning (W, E)
- (Week 4) Machine learning algorithms:
  - Decision tree (W)
  - K-nearest neighbor (W)
  - Support vector machine (W)
  - Hidden Markov model (W)
  - Neural Network (W)
  - Random forest classifier (W)
  - Genetic algorithms (W)
  - Distinction supervised/unsupervised learning (W)
- (Week 4-5) Machine learning steps:
  - Preprocessing (W, E)
  - Feature selection & abstraction (W, E)
  - Data separation (W, E)
  - Classifier training (W)
  - Classifier testing (W)
- (Week 7) Difference low-level and high-level features (W)

Communication

- (Week 1) Models (W)
- (Week 2) Social cognition (W)
- (Week 2) Social perception (W)
- (Week 2) Social gestalt principle (W, E)
- (Week 2) Schemas (W)
- (Week 2) Attribution (W)
- (Week 2-3) Turing test (W, E)
- (Week 3) Chatbots (W, E)
- (Week 3) Natural Language Processing (W, P)
- (Week 3) Bias in Machine learning
  - Historical bias (W, E, P)
- (Week 6) Cannon-Bard & James-Lange theories of emotion (W)
- (Week 7) Function of emotions (W)

Cognition

- (Week 2) Gestalt principles (W, E)
- (Week 5) Multi-voxel pattern analysis (W, P)
- (Week 5-6) fMRI
  - Voxels (W)
  - Hemodynamic Response Function (W)
  - fMRI data (W)
  - Basic neuroscientific terms:
    - Neuron (W)
    - Axon (W)
    - Neurotransmitter (W)
    - Gyri & Sulci (W)
  - (Week 6) Visual processing
    - V1-V5 (W, P)
  - What & where pathways (W, P)
Problem of opaqueness in AI:
- AI algorithms become more advanced and complex: It gets harder to understand their inner workings (decisions are not comprehensible enough)
- “Black Box” (e.g. they do not reveal how decisions concerning job, college were made)

Deep Learning:
- Subset of Machine Learning / Artificial Intelligence function: HIERARCHICAL & MULTILAYERED
- Learns through an artificial neural network which imitate the human brain
- Algorithm is considered to be deep if the input data is passed through a series of nonlinearities or nonlinear transformations before it becomes output
- e.g. autonomous cars, customer service, computer vision

Pattern Ability to find patterns in a set of objects \( \rightarrow \) understanding & representation of
Recognition: complexity (Neural Networks, Hidden Marchov Models, Support Vector Machines)
- E.g. Machine vision, data mining, computer-aided diagnosis

Machine Learning Algorithms:
SUPERVISED
- **Decision tree (W):**
  Decision support tool uses hierarchical tree-like graph
  of decisions and their possible consequences
  - Non-metric

- **Support vector machine (W):**
  Binary classification algorithm: Splits data in the best possible way
  - *Support vectors* = data points that lie closest to hyperlane
    \( \text{(data points most difficult to classify)} \)
  - *Hyperplane* = line separating two classes (e.g. red & blue)
  - \( \rightarrow \) Lots of possibilities for a line separating the classes
  - Support Vector Machine finds the optimal solution = maximize margin
  - *Margins* = “widest road possible”
  - Similar to linear regression
  - Don’t overfit