

# Seminar Topics & Projects

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Knowledge Management & Discovery

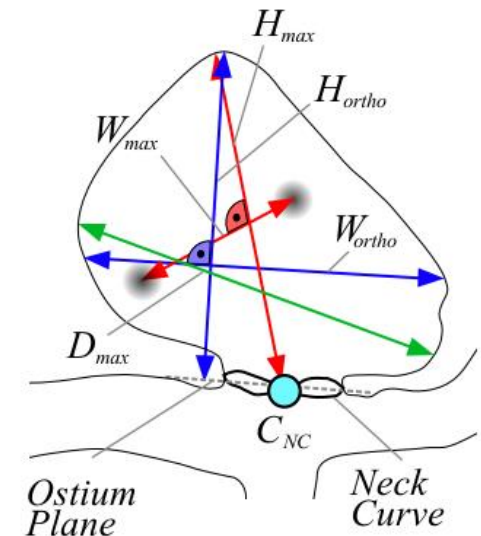
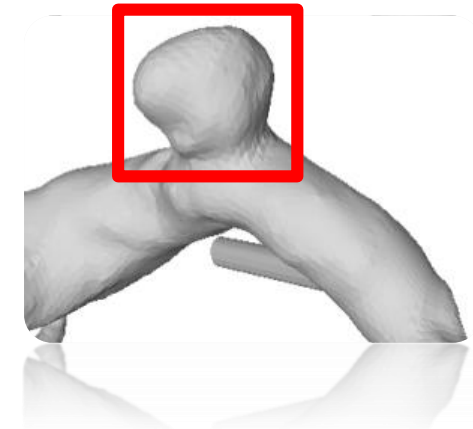
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# Deep Learning for Aneurysm Rupture Risk Prediction

- aneurysm rupture risk assessment is commonly based on morphological and hemodynamic features
- features extraction is tedious and requires careful and accurate segmentation
- treatment decisions are predominantly based on univariate analyses or score calculations for manually created indices

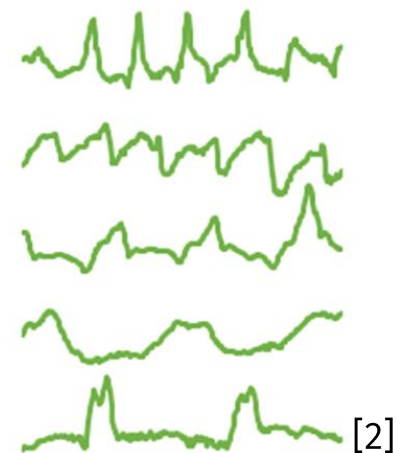
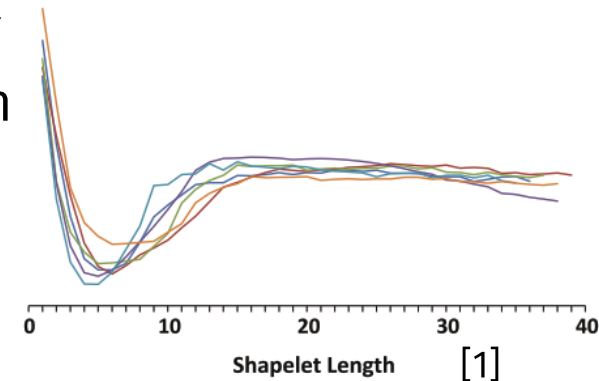
**Task: literature survey on the potential of Deep Learning for aneurysm rupture risk prediction**

- performance of models trained on raw image data
- comparison with models trained on handcrafted features
- common network architectures



# Diverse Shapelet Discovery

- **shapelets** = class-representative subsequences of time-series for classification and visual exploration
- exhaustive generation leads to abundance of partially redundant shapelets
- ranking/filtering mechanism is required that strikes a balance between
  - class representativeness (e.g. Infogain) and
  - diversity / non-redundancy (e.g. correlation)
- implementation of
  - a ranking algorithm
  - a filtering algorithm (return  $k$  most important)
  - an application for visual exploration and comparison

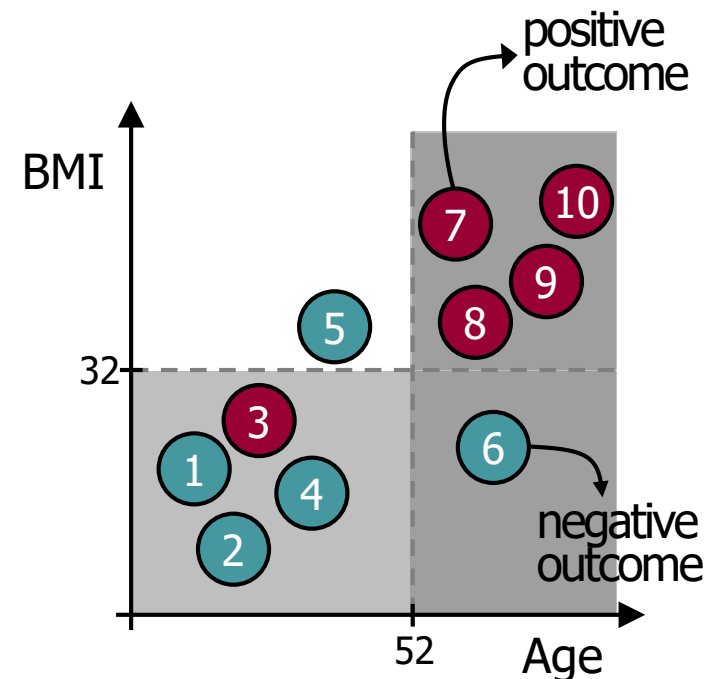


[1] Hills, Jon, et al. "Classification of time series by shapelet transformation." *Data Mining and Knowledge Discovery* 28.4 (2014): 851-881.

[2] Bagnall, Anthony, et al. "The great time series classification bake off: a review and experimental evaluation of recent algorithmic advances." *Data Mining and Knowledge Discovery* 31.3 (2017): 606-660.

# Diverse Subgroup Discovery

- Subgroup Discovery (SD): identify *interesting* subpopulations described by interpretable rules
- interestingness measures based on...
  - coverage/support
  - precision/confidence
  - user preference
  - hybrid
- redundancy is a challenge
- **Task: literature survey on approaches to reduce redundancy in SD**
  - frameworks, algorithms, implementations



- $R_1: [\text{Age} > 52] \rightarrow [\text{POS}]$
- $R_2: [\text{BMI} > 32] \rightarrow [\text{POS}]$
- $R_3: [\text{Age} > 52 \wedge \text{BMI} > 32] \rightarrow [\text{POS}]$

- [1] van Leeuwen, Matthijs, and Arno Knobbe. "Diverse subgroup set discovery." *Data Mining and Knowledge Discovery* 25.2 (2012): 208-242.
- [2] Duivesteijn, Wouter, Ad J. Feelders, and Arno Knobbe. "Exceptional model mining." *Data Mining and Knowledge Discovery* 30.1 (2016): 47-98.

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Good Luck!