CogniPredictAD project proposal

DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE

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Slide 1/3: Problem Description

- ***Predict the baseline diagnosis** (**DX**) of **ADNI** participants using only the attributes detected at baseline. The objective is to build a classifier that, starting from clinical, neuropsychological, and genetic variables, assigns the diagnostic class of **Alzheimer Disease**.*

- ***ML techniques** enable the analysis of complex links between biomarkers and symptoms, **automating preliminary diagnoses** and supporting clinical decisions, accelerating screening and research on progression and risk factors.*

- ***Preprocessing:** only baseline visits per subject → removal of columns > 50% missing → KNN imputation → categorical encoding → feature selection (K-Best, RFE, …) → and more …*

- ***Outlier Detection** to remove errors and discover rare clinical profiles.*

- ***Technique: Multiclass Classification**.*

Slide 2/3: Dataset Description

- ***Source:*** *https://adni.loni.usc.edu/*
- ***Raw (ADNIMERGE.csv):*** *16421 rows × 116 columns (all visits).*
- ***Final (preprocessed):*** *2419 rows × 41 columns (of which 1 target = DX).*
- ***Input:*** *vector of clinical, cognitive, genetic and volumetric features (e.g. ADAS13, MMSE, CDRSB, RAVLT, APOE4, brain volumes, age, sex, education).*
- ***Output:*** *ordinal-encoded diagnostic label (DX: 0…4):*
  - *CN (Cognitively Normal): 0*
  - *SMC (Significant Memory Concern): 1*
  - *EMCI (Early Mild Cognitive Impairment) : 2*
  - *LMCI (Late Mild Cognitive Impairment): 3*
  - *AD (Alzheimer's Disease): 4*

Slide 3/3: References

- *ADNI LONI Official Website: https://adni.loni.usc.edu/*
- ADNI Introduction (Mueller et al., 2005): https://alz-journals.onlinelibrary.wiley.com/doi/abs/10.1016/j.jalz.2005.06.003
- *Use of ADNIMERGE dataset for Machine Learning: https://peerj.com/articles/cs-2437/*
- *Using the ADNIMERGE dataset for Machine Learning prognosis: https://www.researchgate.net/publication/371729203_A_Machine_Learning_Approach_for_Predicting_Deterioration_in_Alzheimer's_Disease*