The Alzheimer's Disease Prediction Of Longitudinal Evolution challenge

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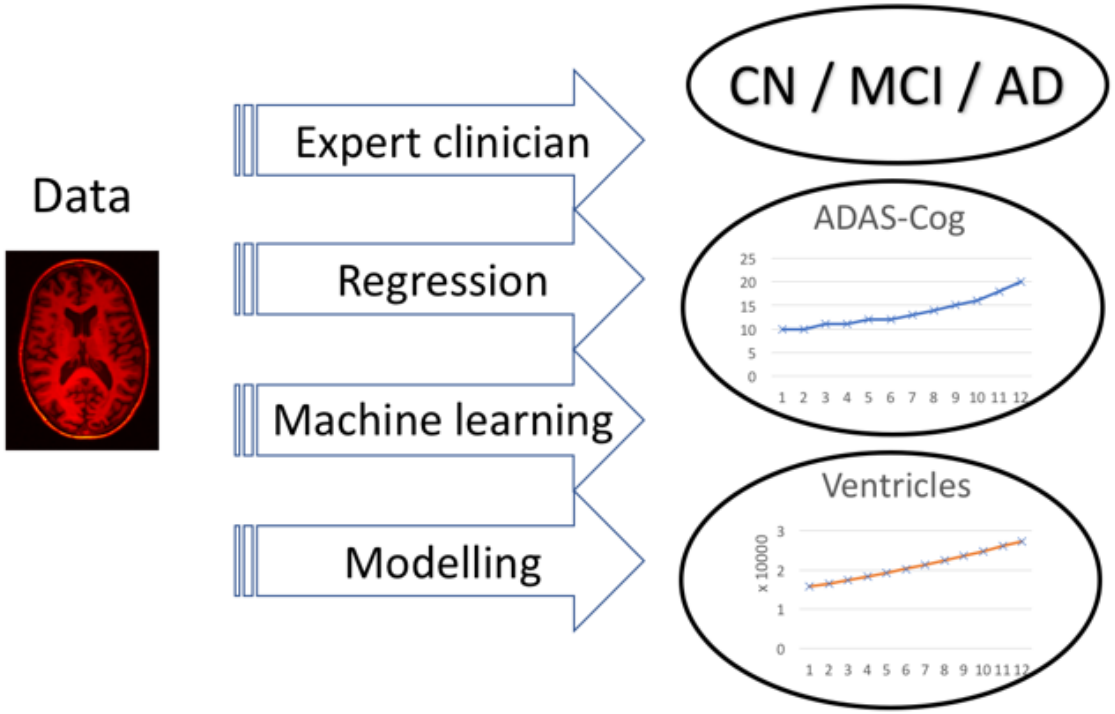
What is TADPOLE?

- A challenge to predict progression of individuals at risk of AD.
- Identify people that will develop AD over the next 1-5 years.
- ADNI provide data on up to 1100 “rollover” subjects.
- TADPOLE stores forecasts and evaluates on follow-up data.



Why is it important?

- Dementia is a key challenge for 21st Century healthcare.

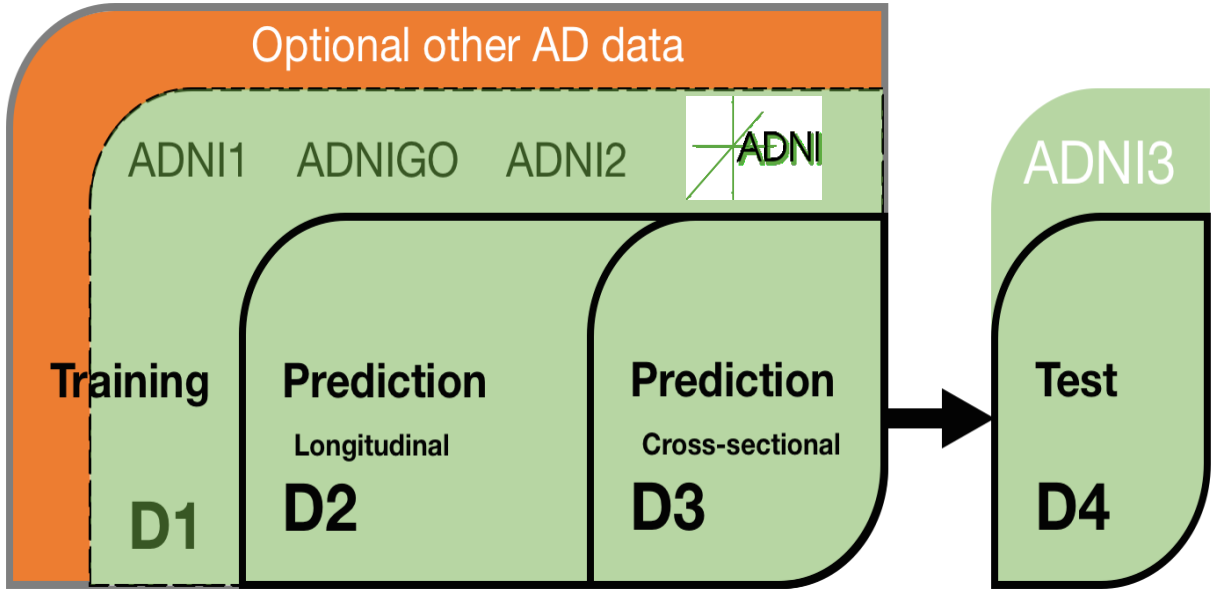
- No disease modifying treatments exist.

Source: ARUK – www.dementiastatistics.org

- Clinical trials routinely fail. Cohort selection is a key factor.

- How predictable is progression to AD?
- How can we best predict outcomes?
- Can we use these methods to improve clinical trials?

What data is available?



- The ADNI data set includes:
  - Imaging (MRI, PET)
  - Cognitive scores
  - CSF Biomarkers
  - Genetics and demographics
- We have constructed
  - D1 – comprehensive longitudinal training set
  - D2 – longitudinal prediction set (expected rollovers - defines list of individuals to forecast)
  - D3 – cross-sectional prediction set (expected rollovers)
- Participants can use any data or processing steps they choose
  - The list of individuals to forecast is fixed.
- Other relevant and available data sets include:
  - http://www.gaain.org,
  - https://aibl.csiro.au,
  - https://neugrid4you.eu/datasets,
  - http://www.ucl.ac.uk/drc/research/methods/miriad-scan-database.

	A	B	C	D	E	F	G	H	I	J	K	L
1	RID	Forecast Month	Forecast Date	CN relative likelihood	MCI relative likelihood	AD relative likelihood	ADAS13	ADAS13 50% lower	ADAS13 50% upper	Ventricles_ICV	Ventricles_ICV 50% lower	Ventricles_ICV 50% upper
2	2	1	2018-01									
3	2	2	2018-02									
4	2	3	2018-03									
5	2	4	2018-04									
6	2	5	2018-05									
7	2	6	2018-06									
8	2	7	2018-07									
9	2	8	2018-08									
10	2	9	2018-09									
11	2	10	2018-10									
12	2	11	2018-11									
13	2	12	2018-12									
14	2	13	2019-01									
15	2	14	2019-02									
16	2	15	2019-03									
17	2	16	2019-04									
18	2	17	2019-05									
19	2	18	2019-06									
20	2	19	2019-07									
21	2	20	2019-08									
22	2	21	2019-09									
23	2	22	2019-10									
24	2	23	2019-11									
25	2	24	2019-12									
26	2	25	2020-01									
27	2	26	2020-02									
28	2	27	2020-03									
29	2	28	2020-04									
30	2	29	2020-05									
31	2	30	2020-06									
32	2	31	2020-07									
33	2	32	2020-08									
34	2	33	2020-09									
35	2	34	2020-10									
36	2	35	2020-11									
37	2	36	2020-12									
38	2	37	2021-01									

What to submit

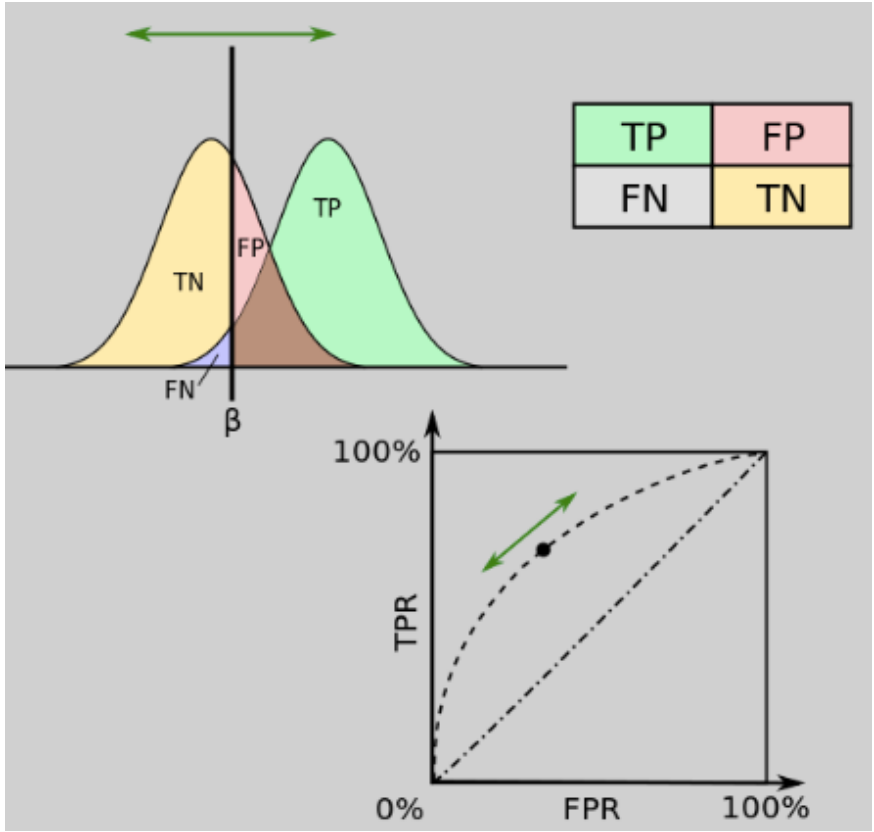
- Participants must submit month-by-month forecasts of:
  - Cognitive status probability: CN, MCI, AD.
  - ADAS13 cognitive score: mean and range.
  - Ventricle volume: mean and range.
  - Probabilities and confidence intervals.
  - Precise acquisition time unknown a-priori
- Declaration and explanation of methods.
- Up to three submissions per challenge participant.

Metrics

- Multi-class area under ROC (mAUC)
- Balanced classification accuracy (BCA)

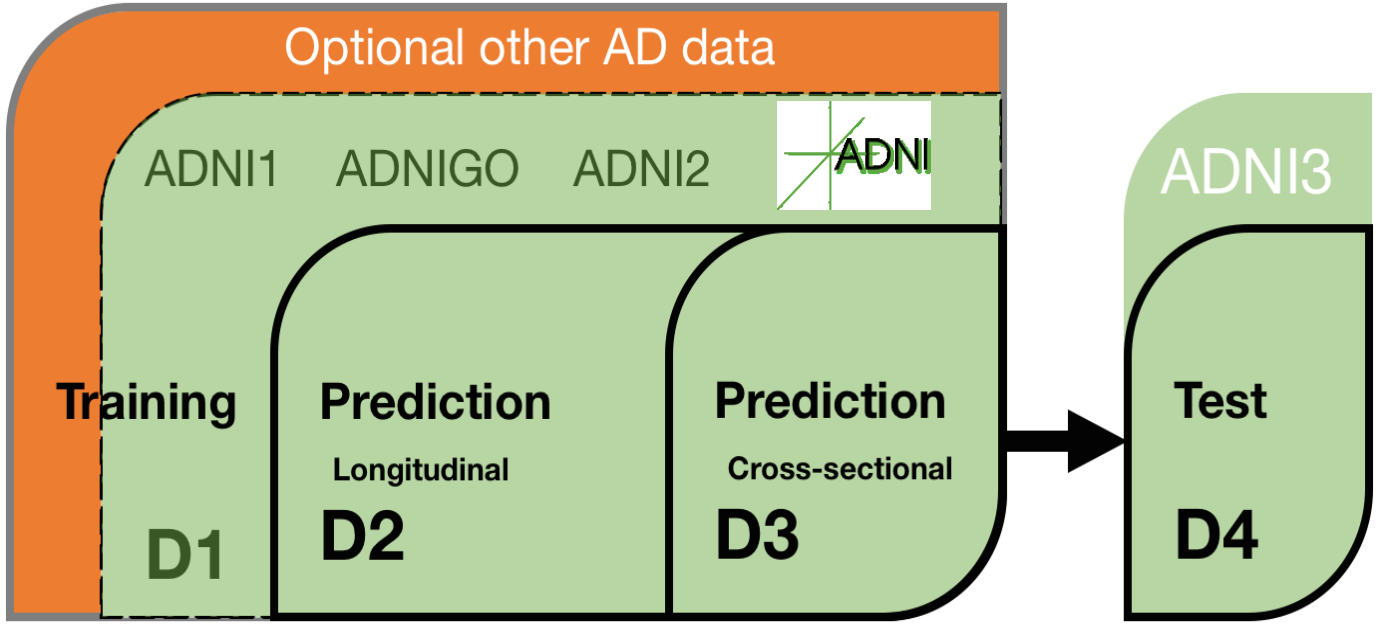
- Mean absolute error (MAE)
- Weighted error score (WES)
- Coverage probability accuracy (CPA)

- Bootstrap uncertainty



How to enter

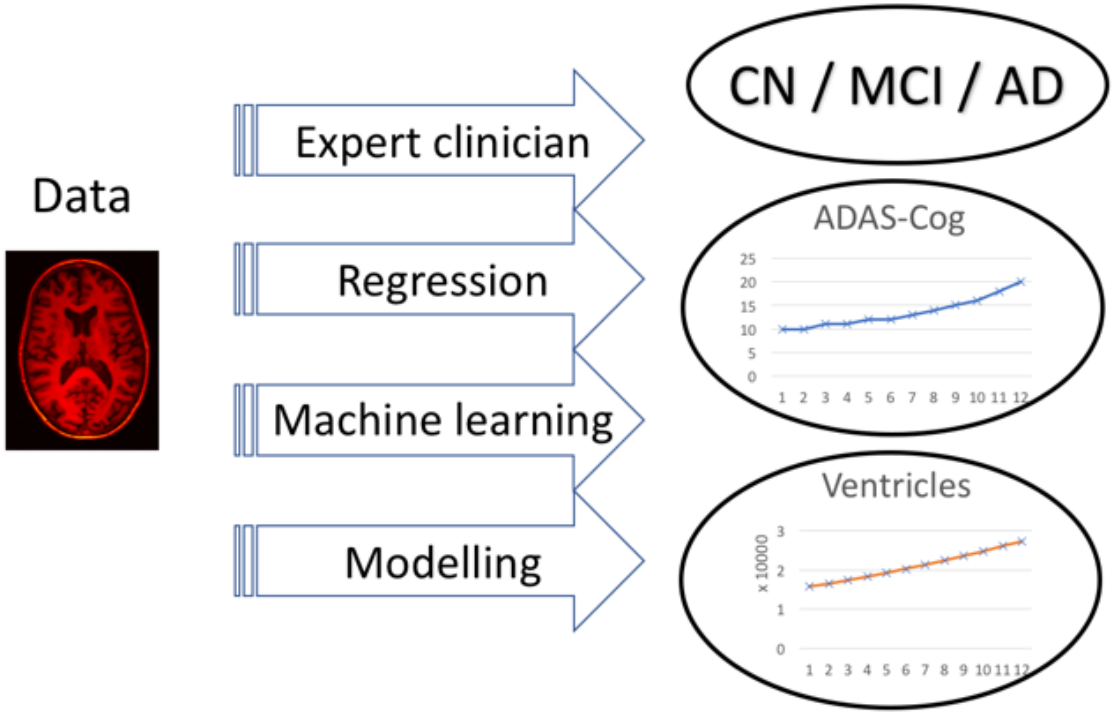
- Simple version:
  - Use D1 and D2.
  - Forecast at least one variable (probably clinical status).



- Full version:
  - Forecast all outcomes (clinical status, cognitive, ventricle volume)
  - Submit forecasts from D3 as well as D2.
  - Potentially use custom training and prediction data.
  - Challenge entry and publication participation.

Who can participate?

- Anyone!
- Established researchers in academia or industry, e.g
  - Data Scientists
  - Neurologists
- Citizen Scientists
- Students and high school science clubs



Prizes

- Thank you to our sponsors
- Currently a 30K prize fund
- Categories to be decided:
  - One per prediction variable.
  - Different groups: established researchers, students, high-school teams
  - First, second, third place.

Timeline

- Launched: 15 June
- Consultation phase: ends 15 August

We welcome suggestions and feedback

Open webinar 1 on challenge
14:00 GMT+1 Wed 12th July 2017

Open webinar 3 on challenge
14:00 GMT+1 Thu 14th Sept. 2017

Test set complete
Nov. 2018

Publication submitted
March 2019

14:00 GMT+1 Thu 10th Aug. 2017
Open webinar 2 on challenge

15th Nov. 2017
Submission deadline

Jan. 2019
Evaluation results on website

March 2019
Review first phase

How to participate

1. Apply for access to ADNI data
   - http://adni.loni.usc.edu

2. Download TADPOLE challenge data
   - From ADNI follow: Download -> Study data -> Test data -> Data -> “TADPOLE Challenge Data”

3. Submit your forecasts by November

Source: zimbio.com

Thanks, here is some haiku

Man versus machine:
Who can predict AD best?
TADPOLE will decide

Calling all experts,
From both medicine and stats.
Predict AD now!

Want to win thousands?
Then forecast future AD
With TADPOLE Challenge

Feedback: tadpole@cs.ucl.ac.uk