Progress update

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Statement of problem

- Can we predict which ablation procedures will lead to *de novo* RD sites and recurrent AF?
- What can we glean from a cardiac model that will allow us to make that prediction?

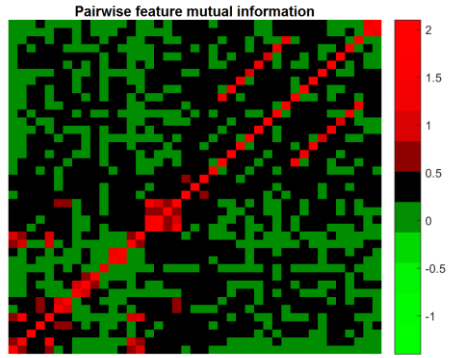
Classification problem: (AF->***AF***) vs. (AF->***AT***)

Extracting features from the dataset: workflow

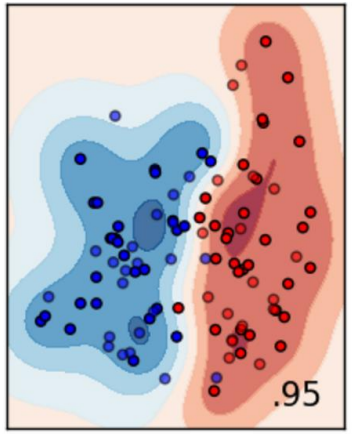
Extract features

Dist. to nearest obstacle		Borderiness		Arrhythmogenicity		
Euclid	Dijkstra	LA	RA	# PSs	#PSs No Duplic	# PS clusters (
751.0435	0	0.917387	0.912888	212618	74573	42
13611.81	16043.06	0.972907	0.956899	47702	13528	53
8477.269	9181.866	0.972907	0.956899	710802	229358	112
25876.79	27920.55	0.972907	0.956899	454788	127725	135
3949.004	3942.711	0.972907	0.956899	120752	33973	41
4826.955	5668.737	0.972907	0.956899	410655	120684	117
26432.16	52036.84	0.942288	0.959208	1276515	457830	195
48615.86	68357.24	0.942288	0.959208	852256	285590	125
42078.65	51135.34	0.942288	0.959208	1357392	496741	186
26273.6	35072.87	0.942288	0.959208	610199	167293	148
7619.392	12146.94	0.942288	0.959208	256278	72183	52
37461.22	47769.9	0.942288	0.959208	461982	145912	91
15728.83	19303.79	0.971103	0.927156	426362	132417	89

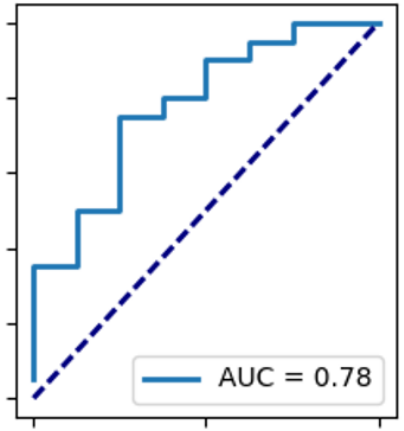
Importance weighting



Apply classifiers



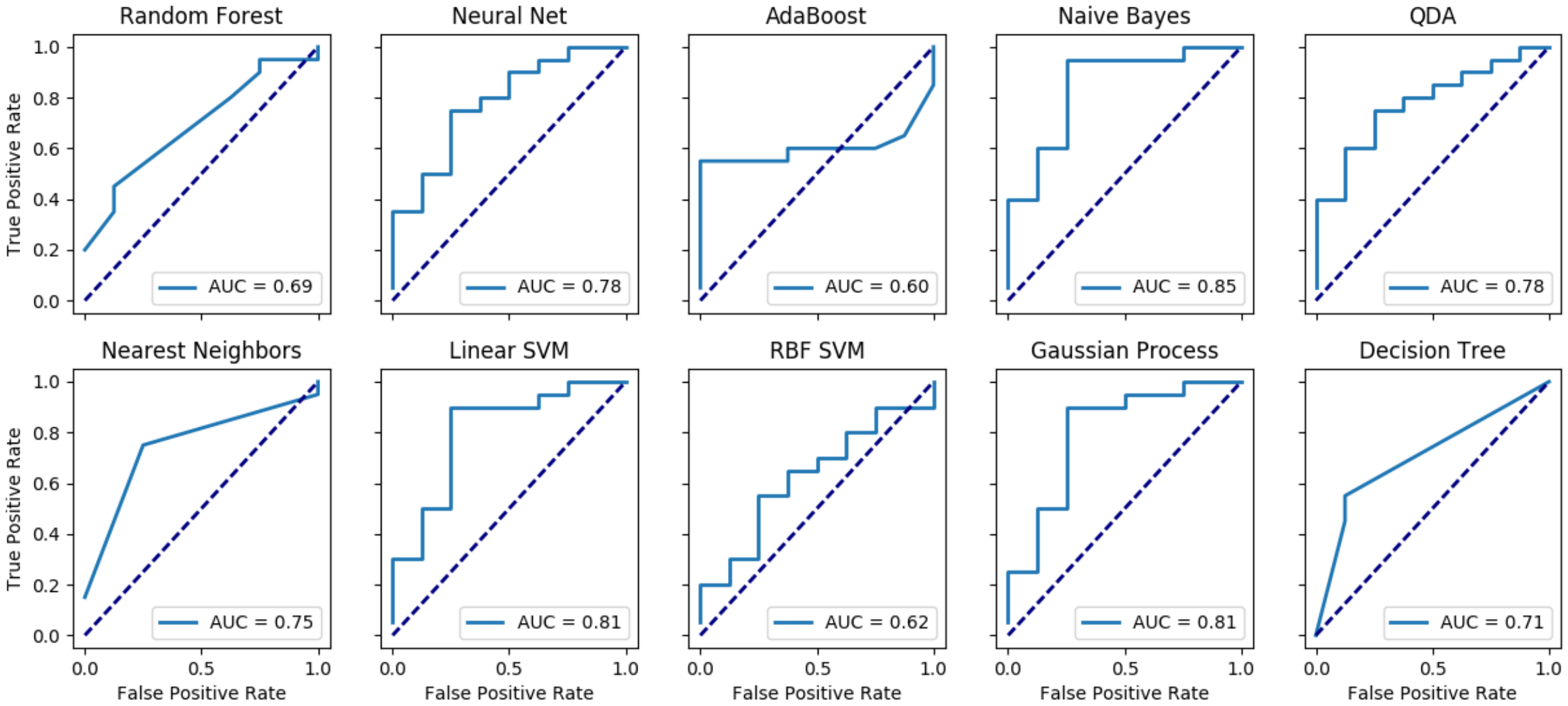
Measure classifying success



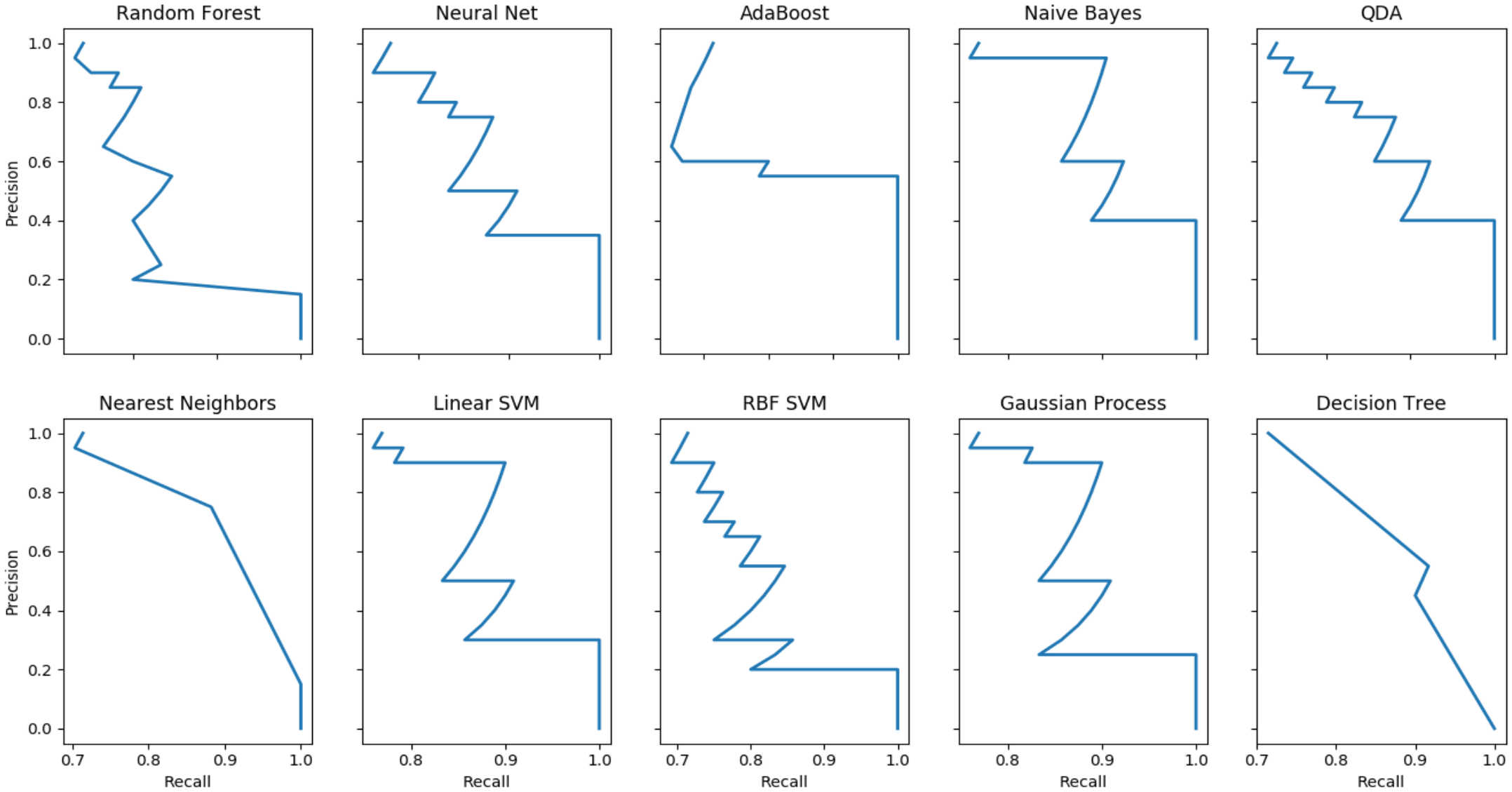
Most discriminative features

- Evaluated by χ^2, *F*-statistic, *mutual information*, and *regression*
- Top three performing features:
  - **Fibrotic burden**
  - **Lesion size**
  - **Proximity of lesion to nearest obstacle (by Dijkstra's algorithm)**

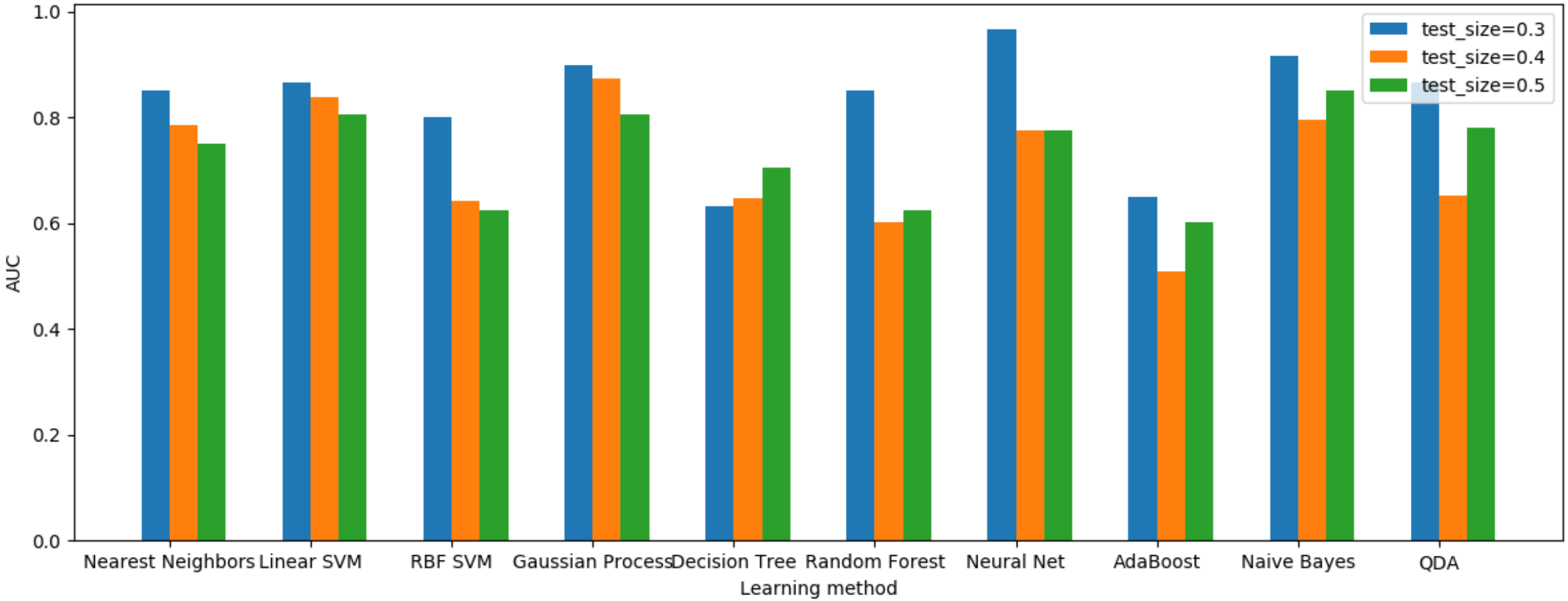
Classification is effective by multiple approaches



Precision recall curves



Classification is robust to approaches and test set portion



Example recurrent heart

- Should I include something here?

Example non recurrent heart

Conclusions

- We can extract fundamentally informative features from:
  - Individual fibrotic architecture
  - Ablation lesion characteristics
- These features allow discrimination of patients into recurrent and nonrecurrent subsets without the need for simulation
- The features are simple and can be easily estimated, making them more accessible and implementable

Future directions

- Check if these features are indicative of recurrence in the clinic
- Run simulations modulating…
  - Ablation size, perimeter/area
  - Closeness to nonconducting obstacle

  …and view reinducibility in each case:
  - Do less circular lesions allow anchoring?
  - Is it the *connection* to nonconducting obstacles, or the proximity?