



NEU+Harvard forecast approach

Q. Zhang, X. Xiong

A. Vespignani

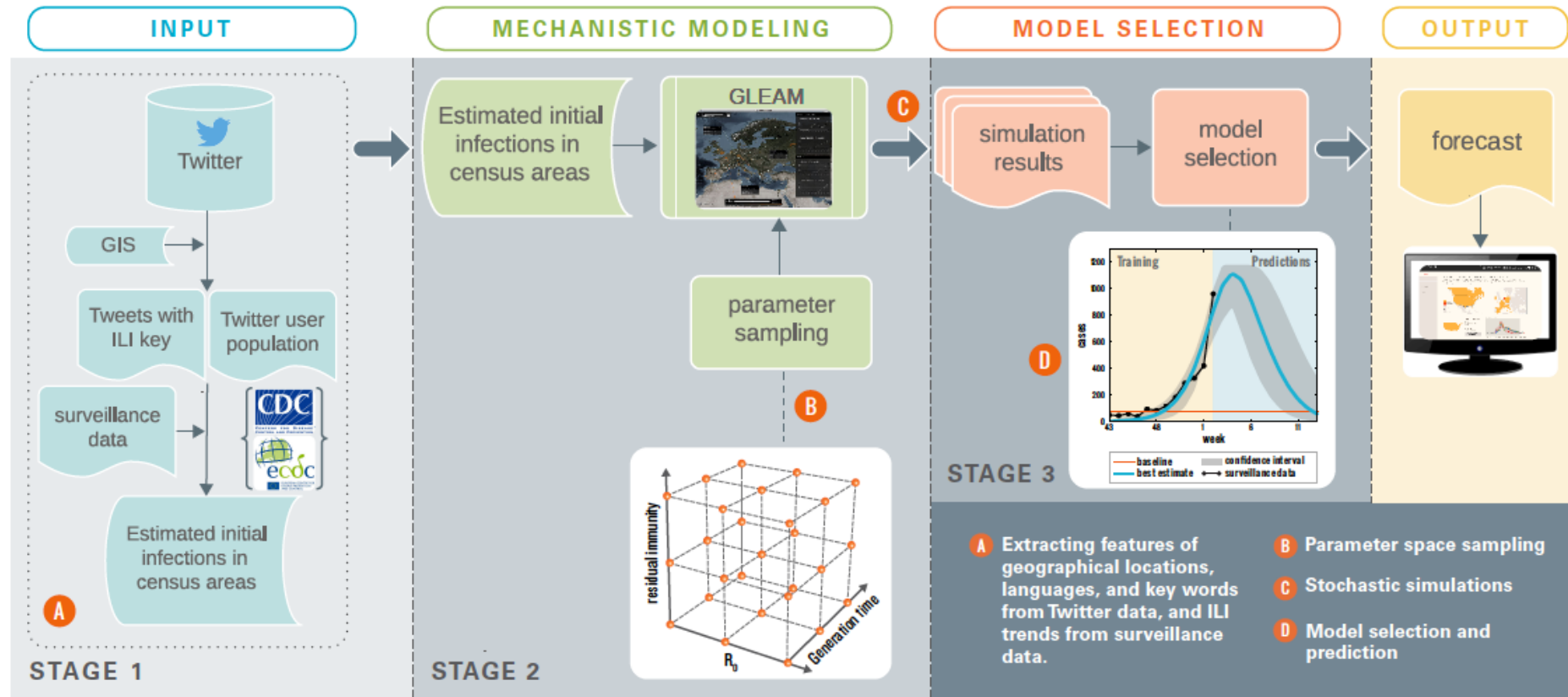
(Northeastern University, USA)

F. Lu, M. Santillana

(Boston Children's Hospital, USA)

- @alexvespi
- @mauSantillana
- @zhangqian_rach

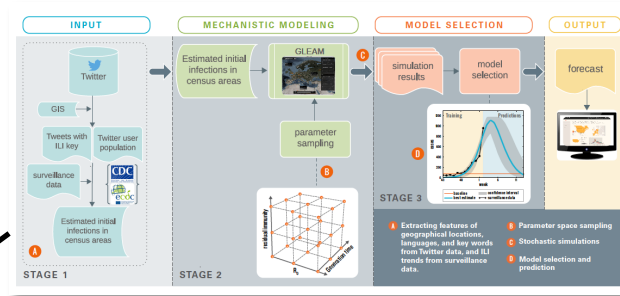
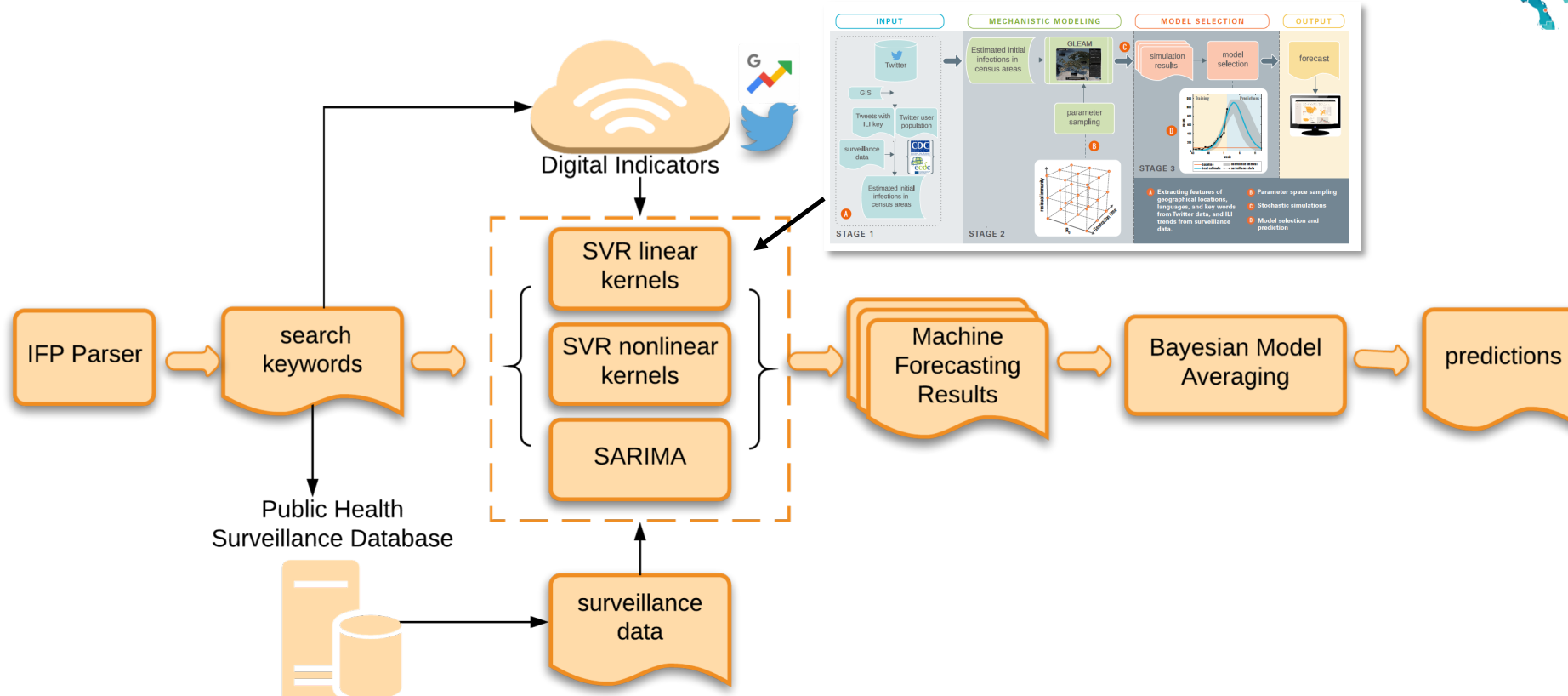
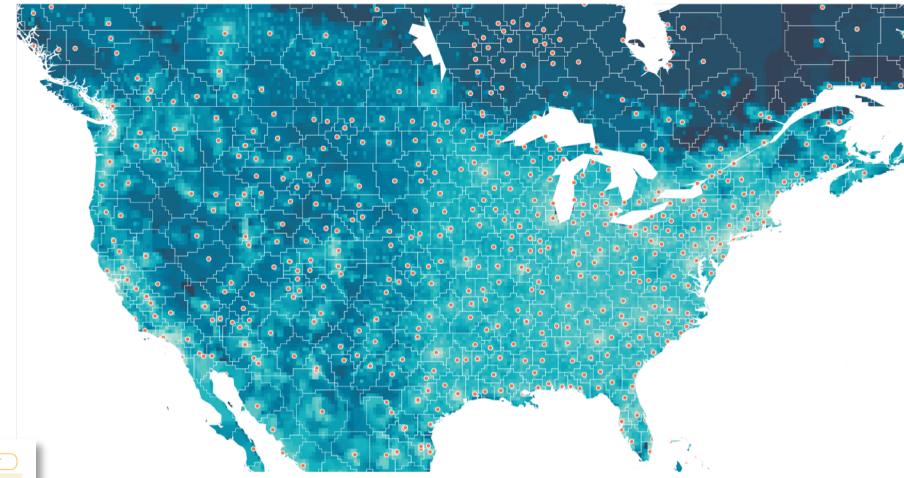
CDC CHALLENGE PREDICTION SYSTEM



Stage 1 x 3: Athena Health data; Twitter data; Flu Near You data

MAIN IMPROVEMENT THIS YEAR:

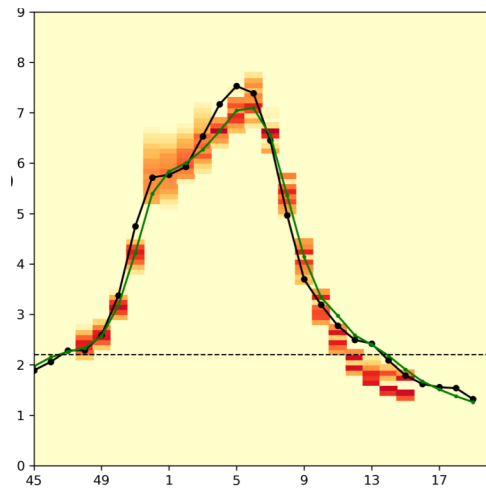
- Multiple data sets to initialize the mechanistic modeling.
- Multiple machine learning algorithms
- Ensemble forecasting
- Data augmentation with Argo



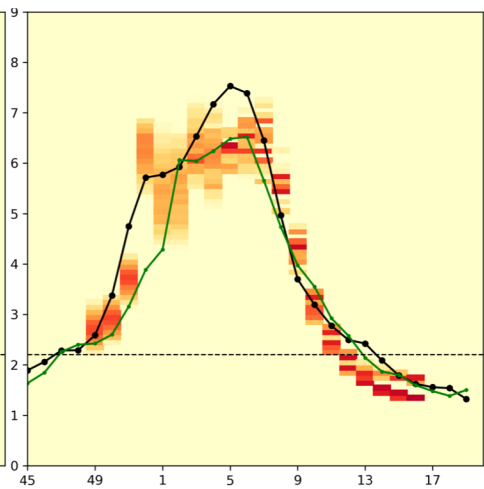
RESULTS

			Peak								
			Pearson correlation				MAPE				
season	country	model	1-wlp	2-wlp	3-wlp	4-wlp	1-wlp	2-wlp	3-wlp	4-wlp	log score
13/14	USA	emm	0.90	0.78	0.73	0.78	0.13	0.18	0.23	0.23	-0.21
13/14	USA	emm+argo	0.96	0.82	0.76	0.78	0.05	0.10	0.14	0.14	-0.21
13/14	USA	emmAug	0.96	0.95	0.90	0.86	0.07	0.09	0.13	0.17	-0.12
13/14	USA	argo	0.96	0.77	0.71	0.74	0.05	0.11	0.14	0.12	-0.12
17/18	USA	emm	0.97	0.91	0.82	0.75	0.09	0.14	0.18	0.20	-0.93
17/18	USA	emm+argo	0.99	0.96	0.86	0.77	0.06	0.11	0.17	0.20	-0.93
17/18	USA	emmAug	0.99	0.95	0.89	0.83	0.07	0.11	0.16	0.20	-0.86
13/14	USA	argo	0.99	0.93	0.81	0.77	0.05	0.13	0.25	0.22	-0.86

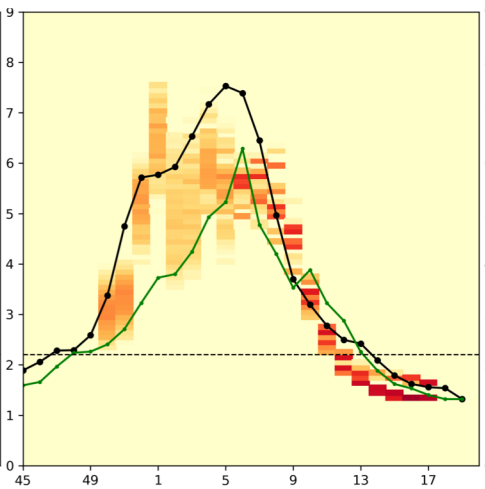
1 week



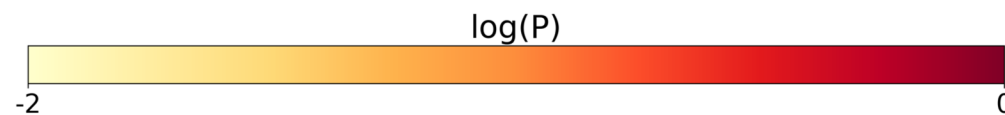
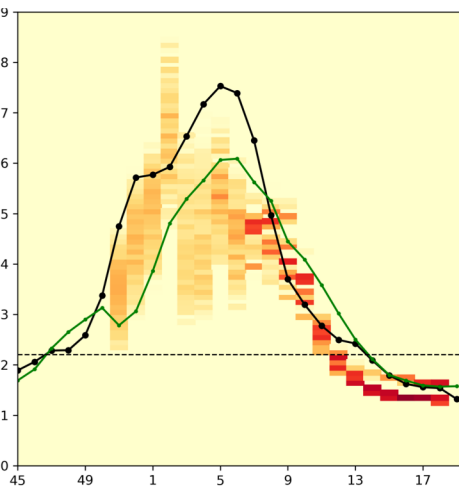
2 week



3 week



4 week

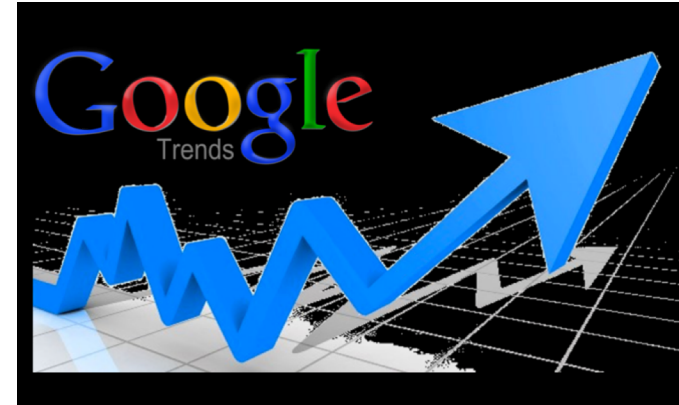


Nowcasting flu activity at the state-level in the US

Spatial-temporal synchronicities

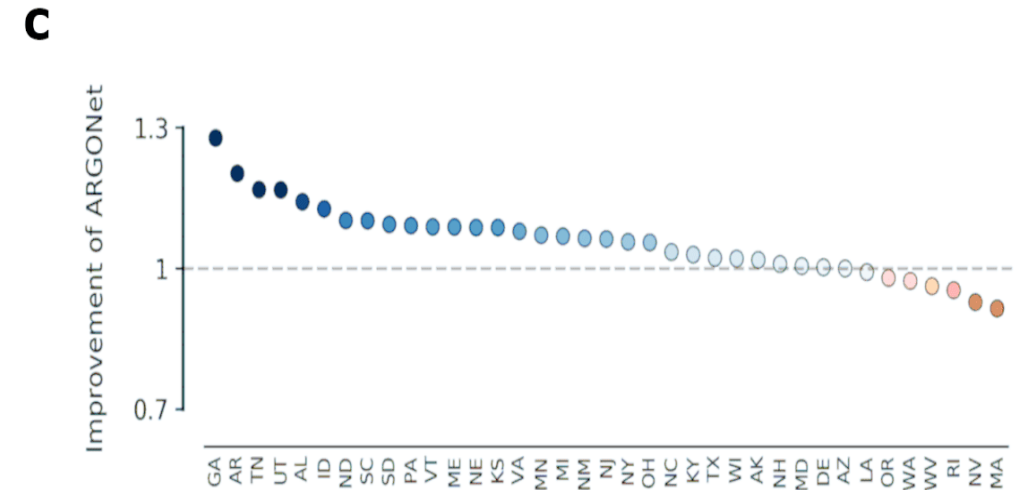
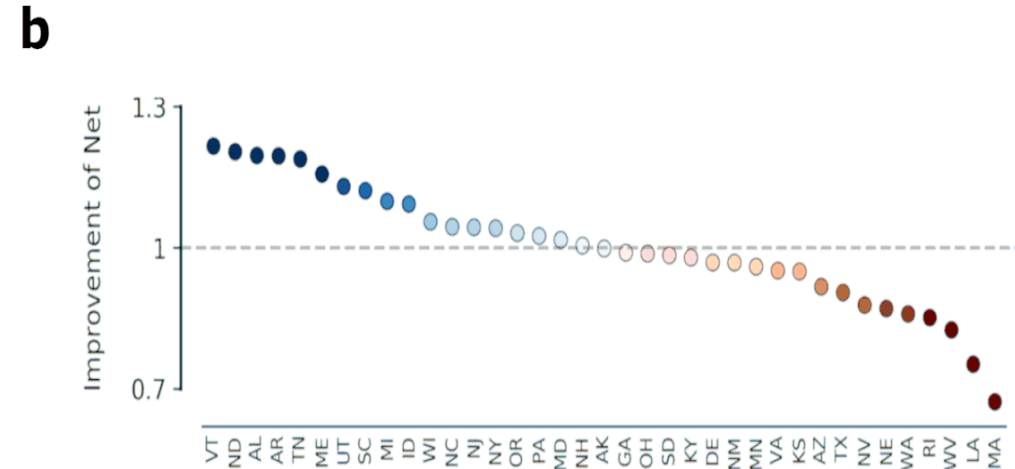
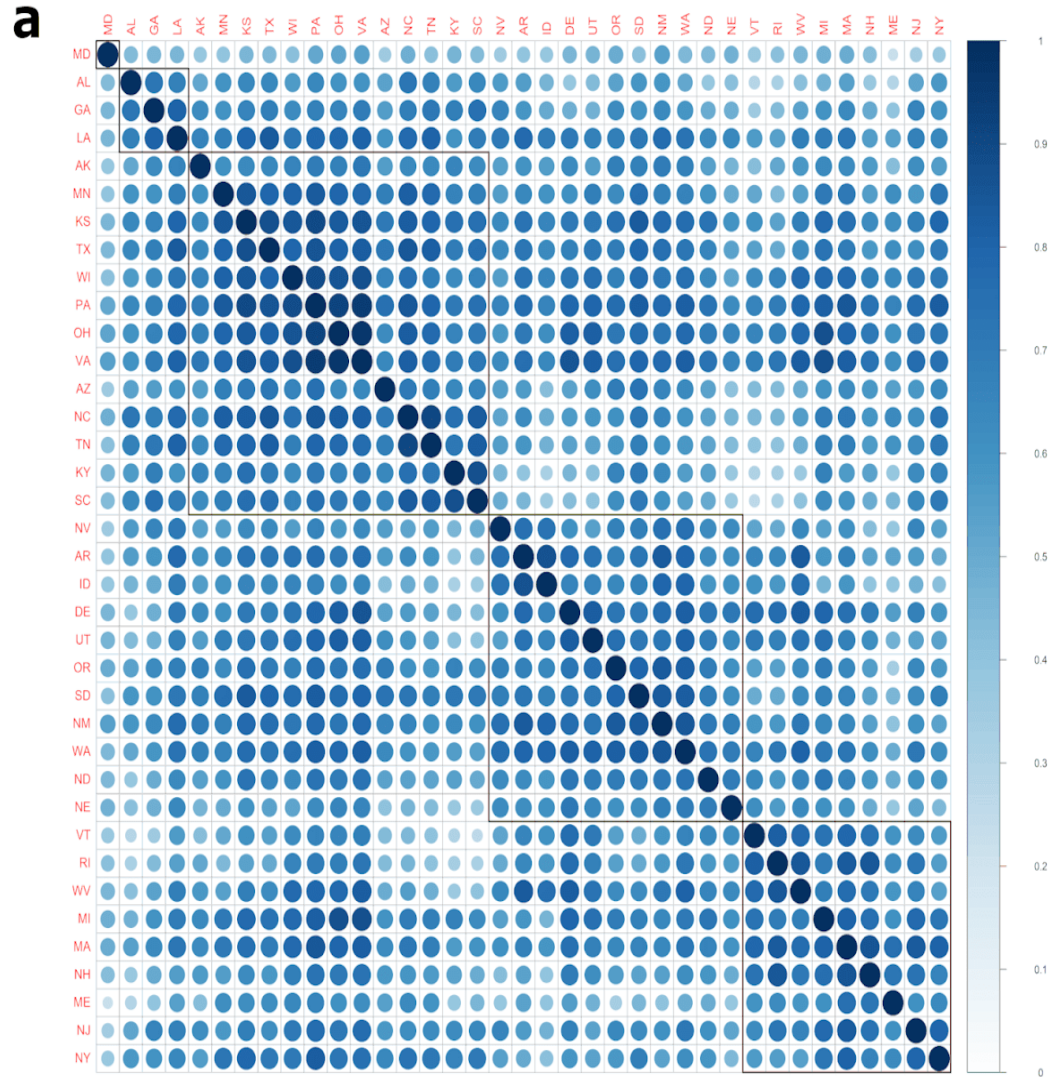


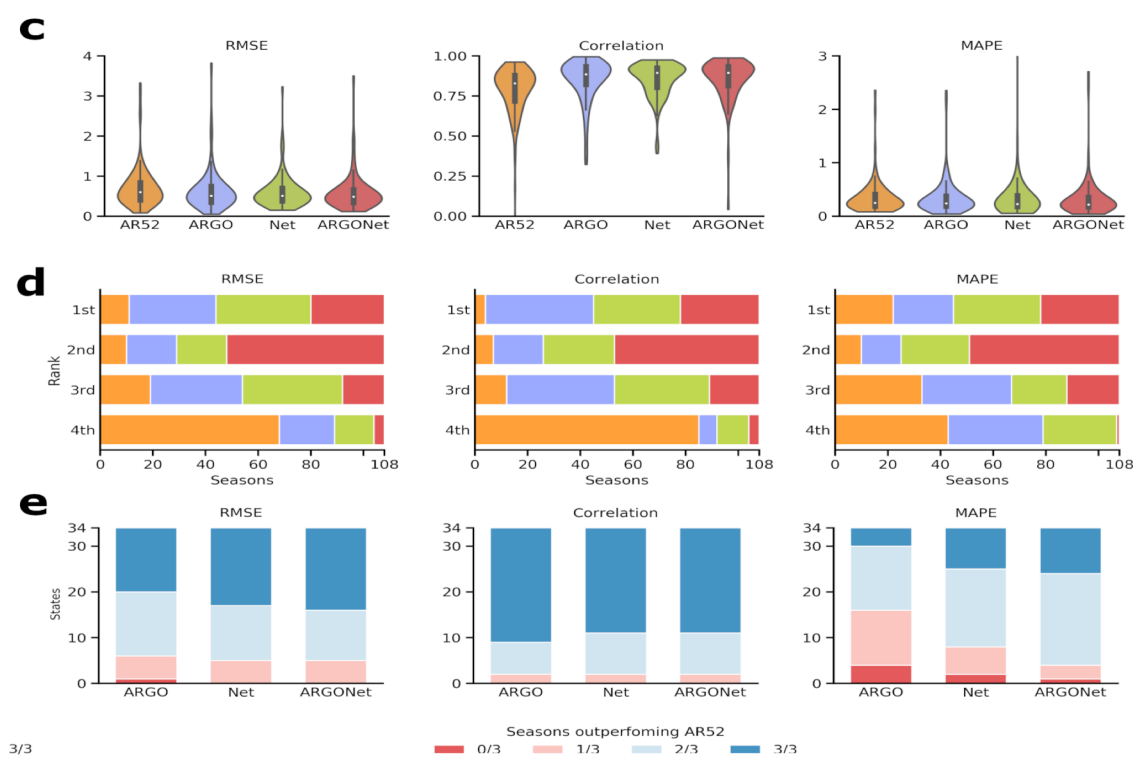
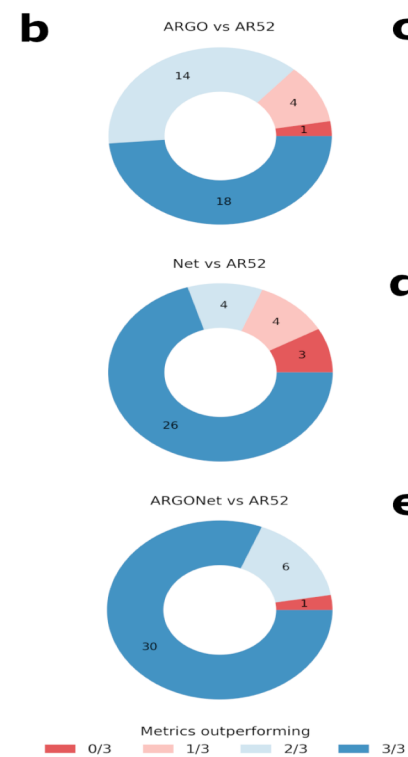
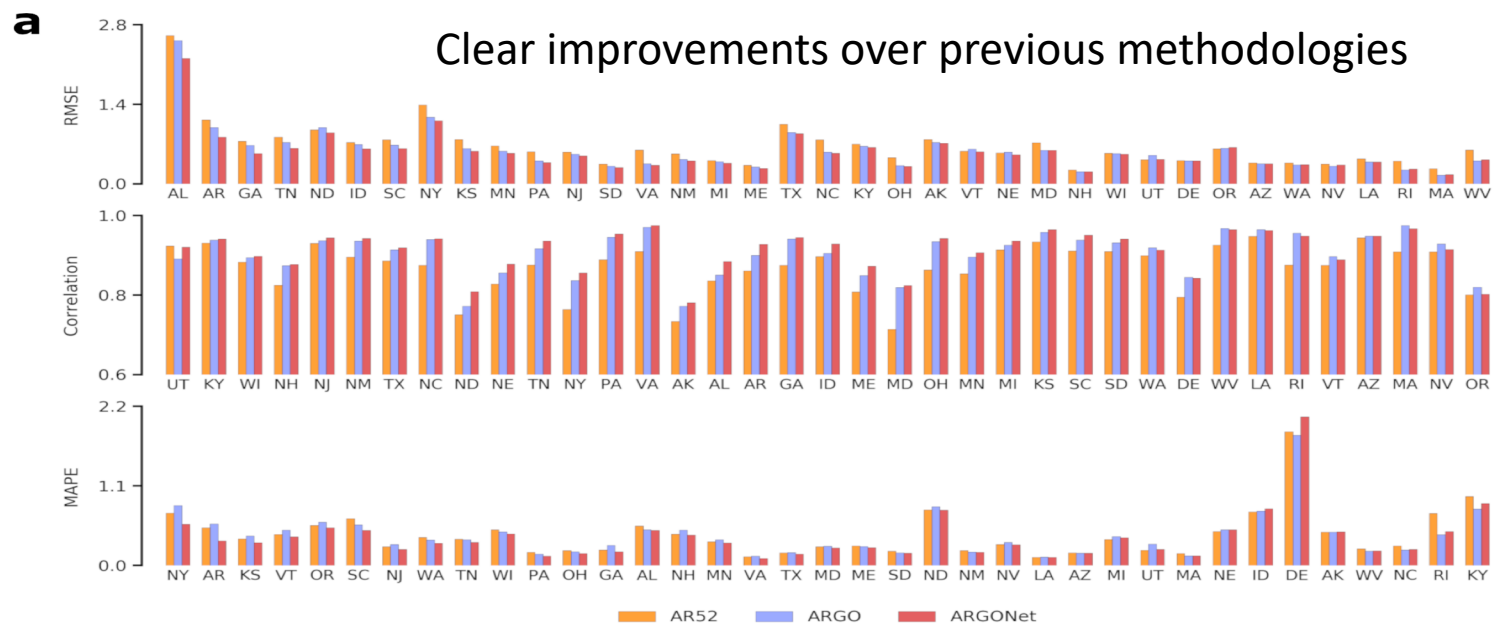
Flu-related Google search
information

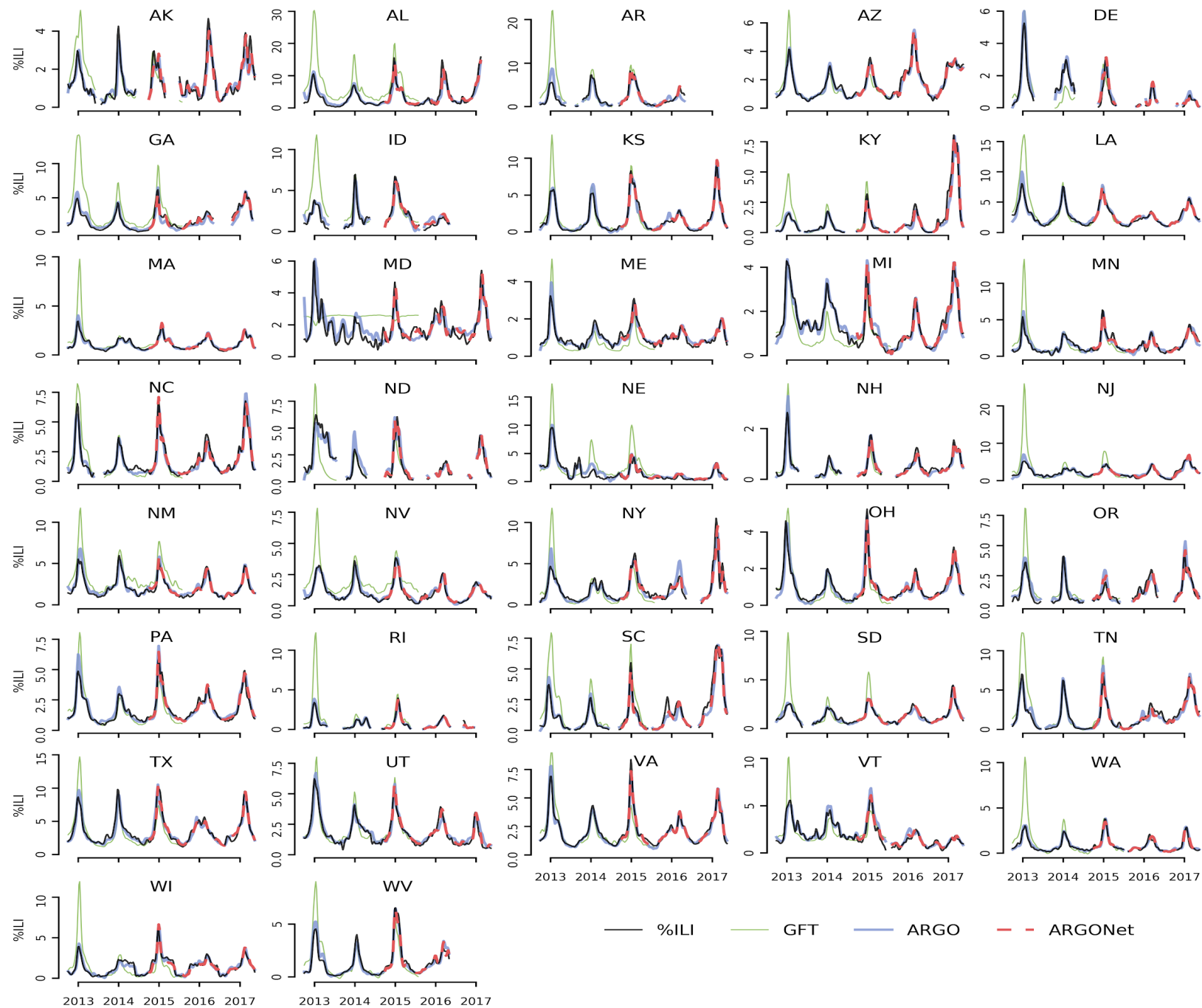


Team:
F. Lu
L. Clemente
M. Hattab
M. Biggerstaff
M. Santillana

Heat map of pairwise %ILI **correlations** between all states.
Boxes denote clusters of highly correlated states.







What's next...

- ~~Introduction of multiple data sources..~~
- ~~Hybrid approach (using inductivist approaches to provide 1-2 week ahead predictions in combination with the mechanistic model)~~
- Introduction of detailed contact matrices.
- MCMC parameter calibration (parallel tempering etc.)
- Analysis of performance determinants....
- Focus on State and regional analysis...
- Use new the new approaches along the entire challenge!!