Influenza Forecasting Framework based on Gaussian Processes

Appendix

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A.1. Supporting Information

The supporting information will provide some additional figures.

A.1.1. Additional Figures

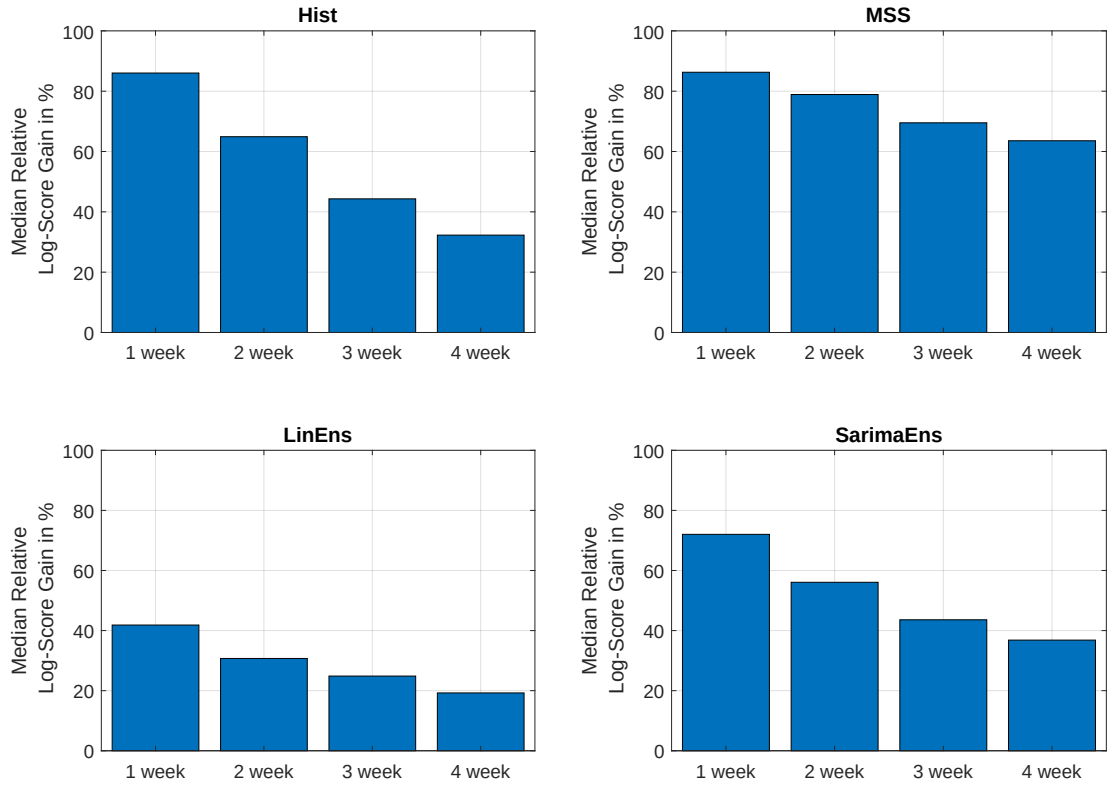

Figure A.1. **Median Relative Log-Score Gain by using our framework**: The four panels show four different benchmarks. Each panel shows the median over all relative log-score gains for the four forecasting horizons.

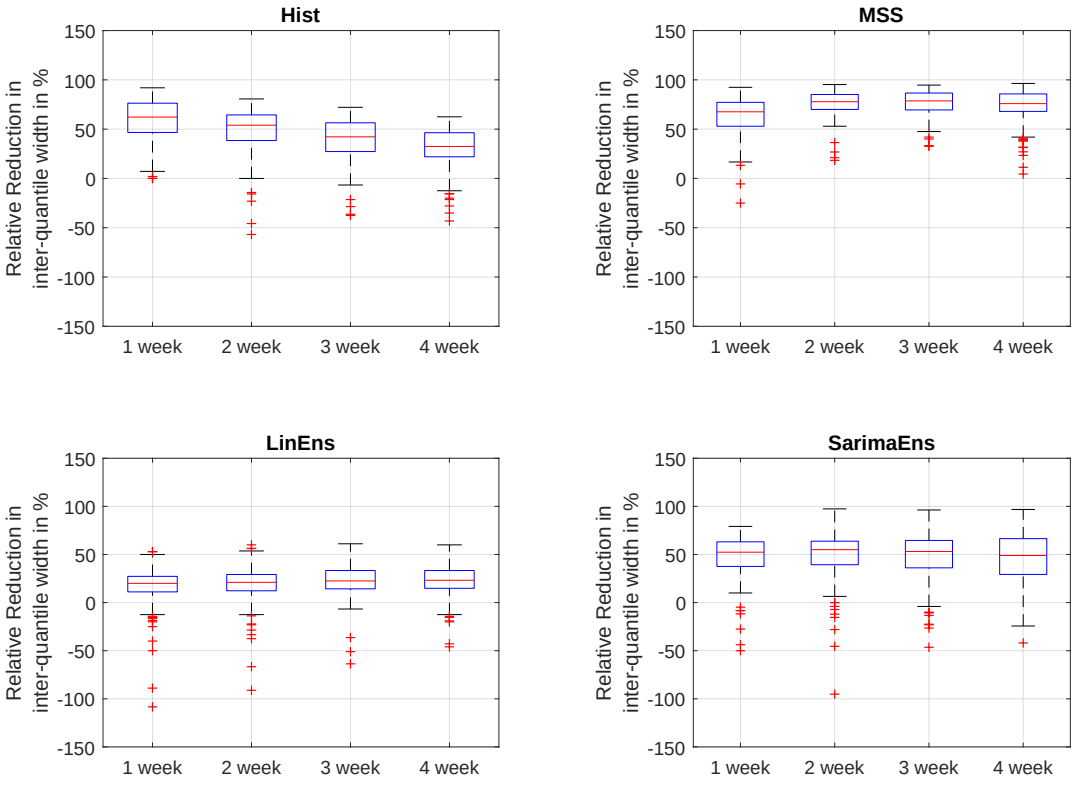

Figure A.2. **Relative Reduction in inter-quantile widths by using our framework:** The four panels show four different benchmarks. Each panel shows boxplots for the four forecasting horizons. Each boxplots visualizes the relative reduction in width of the 95% prediction intervals.

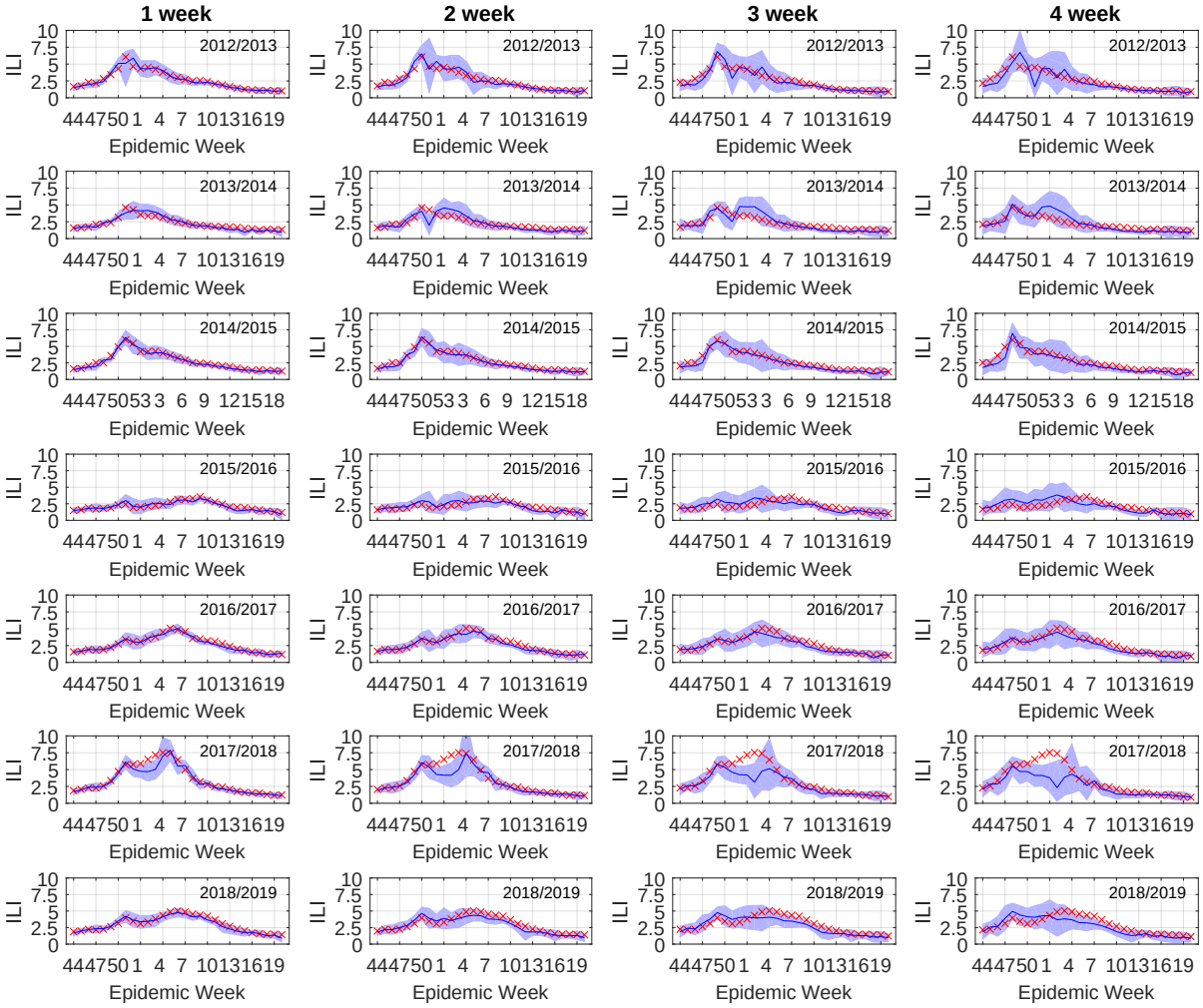

Figure A.3. **Retrospective forecasts for our GP ensemble and their uncertainty:** One week retrospective influenza forecasting for two seasons and targets with our GP based framework for seasonal epidemics forecasting. Red x are the actual observed values, blue line represents point forecasts and blue shaded area 95% prediction intervals. The columns represents different forecasting horizons.

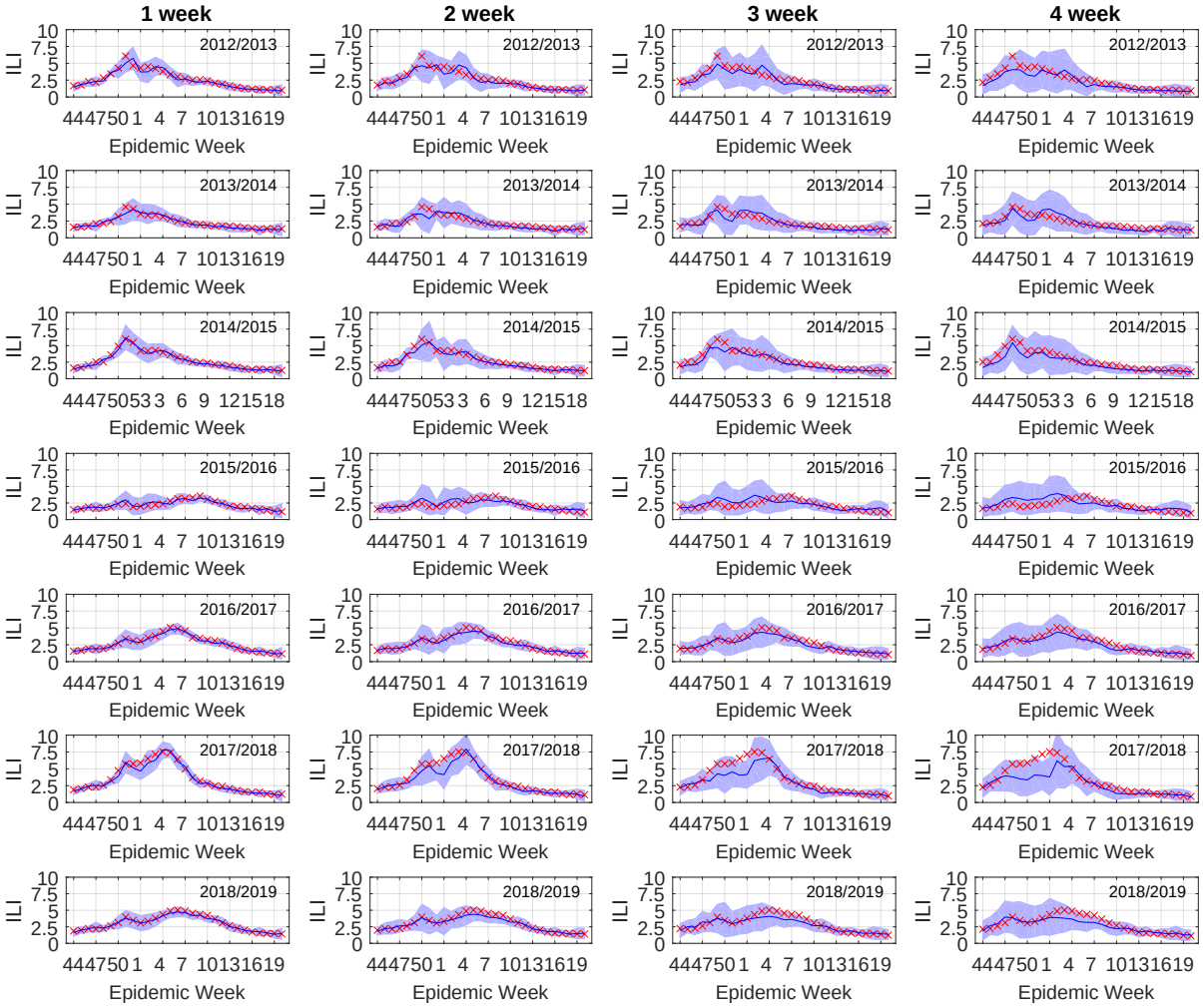

Figure A.4. Same as in Figure A.3 but for Linear ensemble

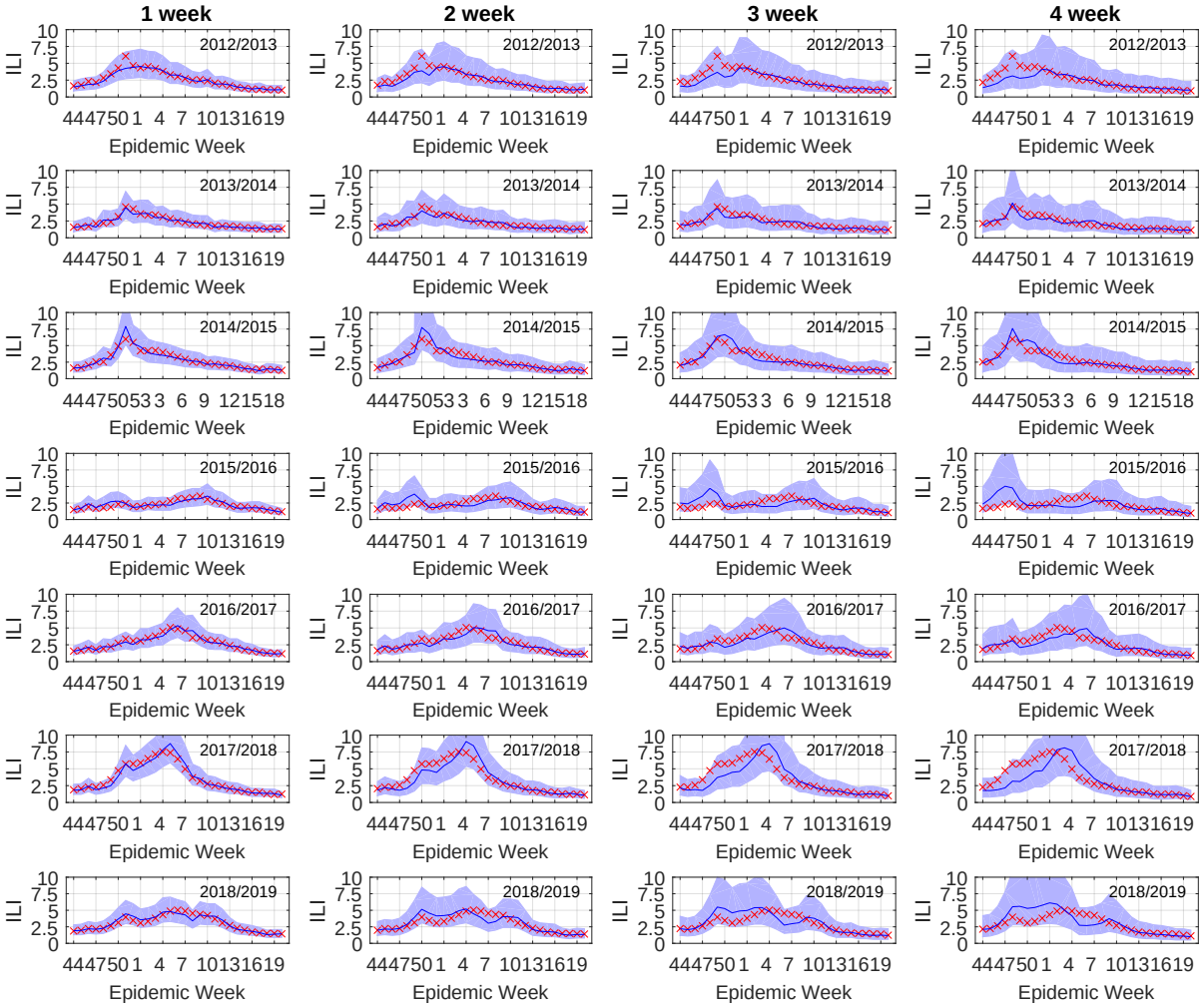

Figure A.5. Same as in Figure A.3 but for Sarima ensemble

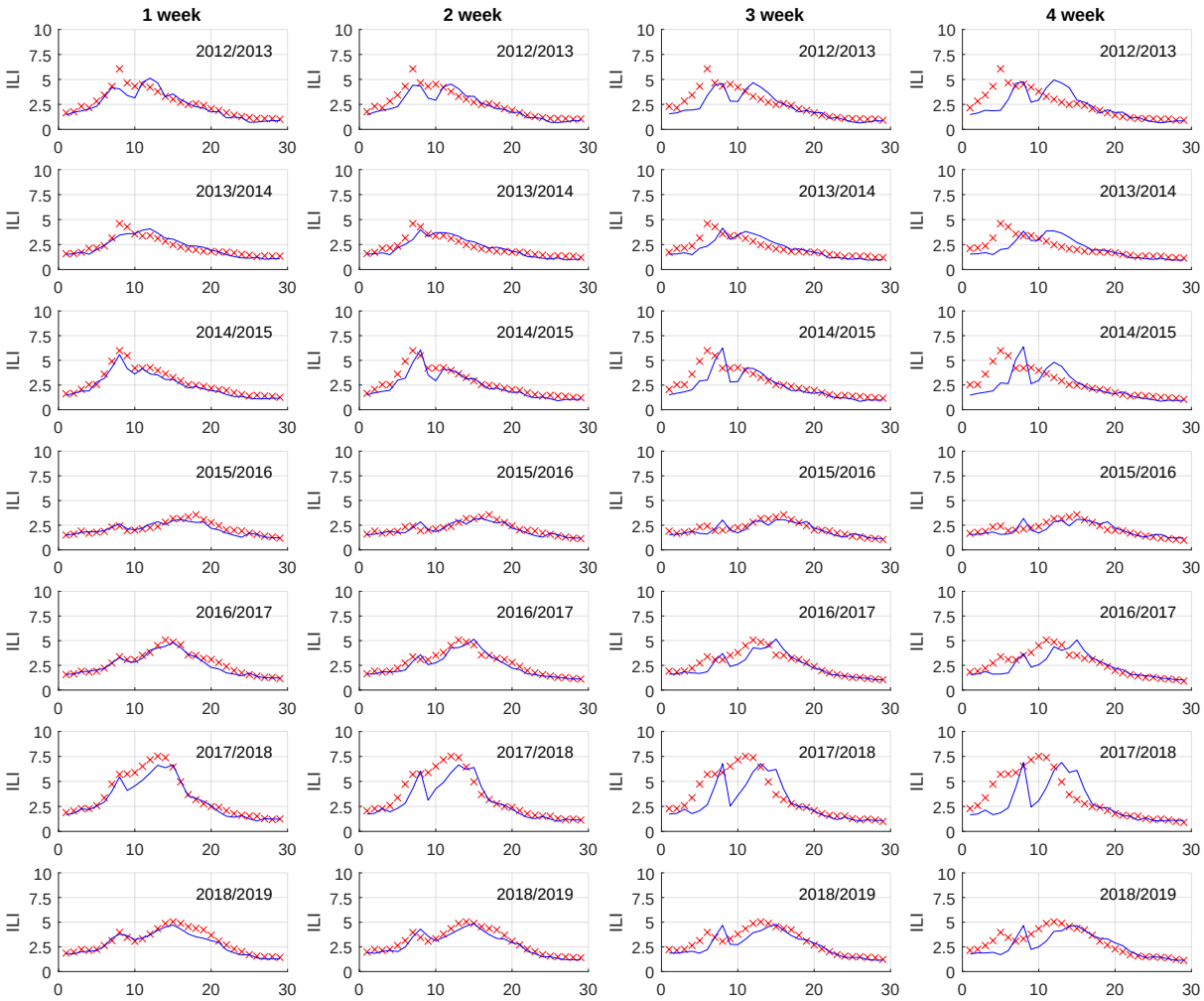

Figure A.6. Same as in Figure A.3 but for EpiDeep ensemble

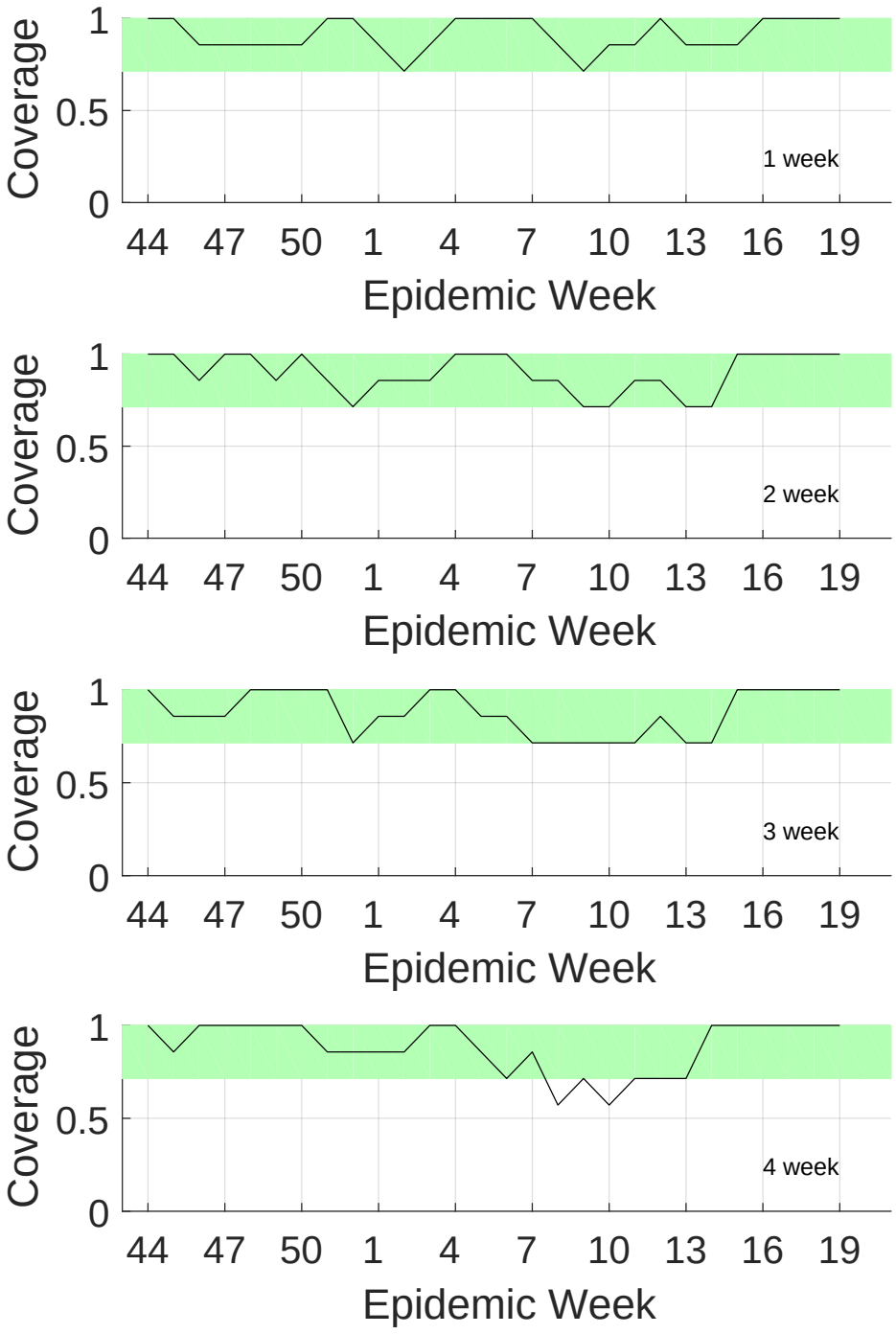

Figure A.7. **Coverage of our framework:** Fraction of true values observed that are within the 95% prediction intervals (black line). As this is a binomially distributed random number, we can add its 95% confidence intervals (green shaded area) to check whether our framework yields reliable uncertainty estimation.

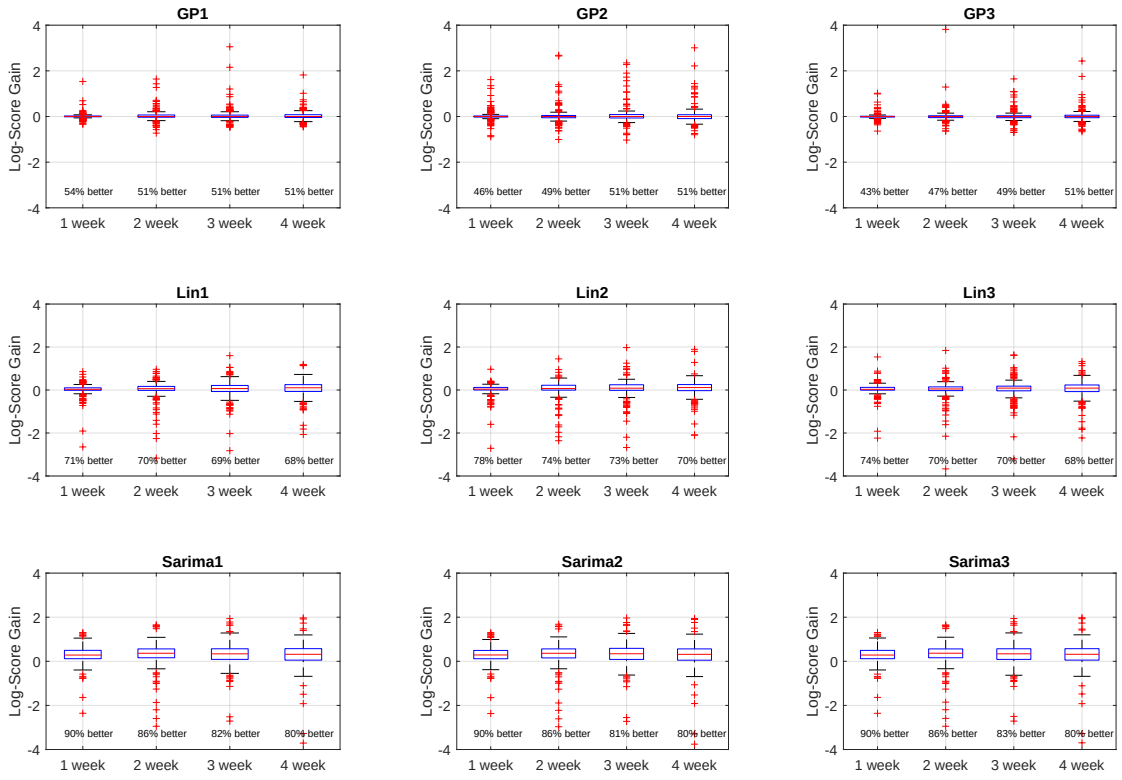

Figure A.8. **Ensemble is indeed better than individuals:** Boxplots as in Figure 3 but comparing our GP ensemble to the individual components of itself and the competitors. Results are not stronger for the GP individuals but those are more robust as can be seen in the next figure A.9.

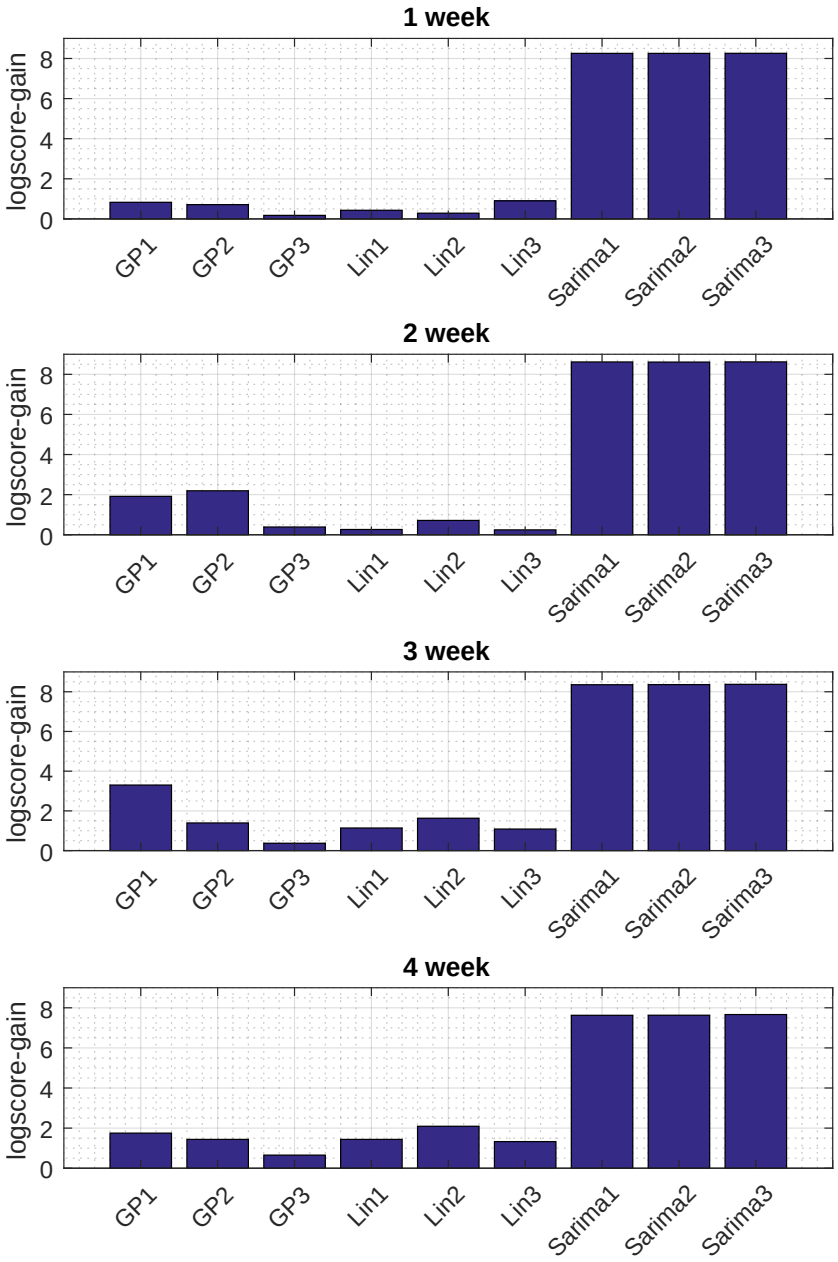

Figure A.9. **Ensemble is indeed better than individuals – average:** Barplots as in Figure 4 but comparing our GP ensemble to the individual components.

Figure A.10. **Visualizing influenza forecasting video:** Four panels show four different forecasting horizons. In each panel red "x" are the data points observed so far. The blue line is the point forecast and the blue shaded area the prediction intervals. The video can be found in the file Influenza-forecasting-in-action.avi