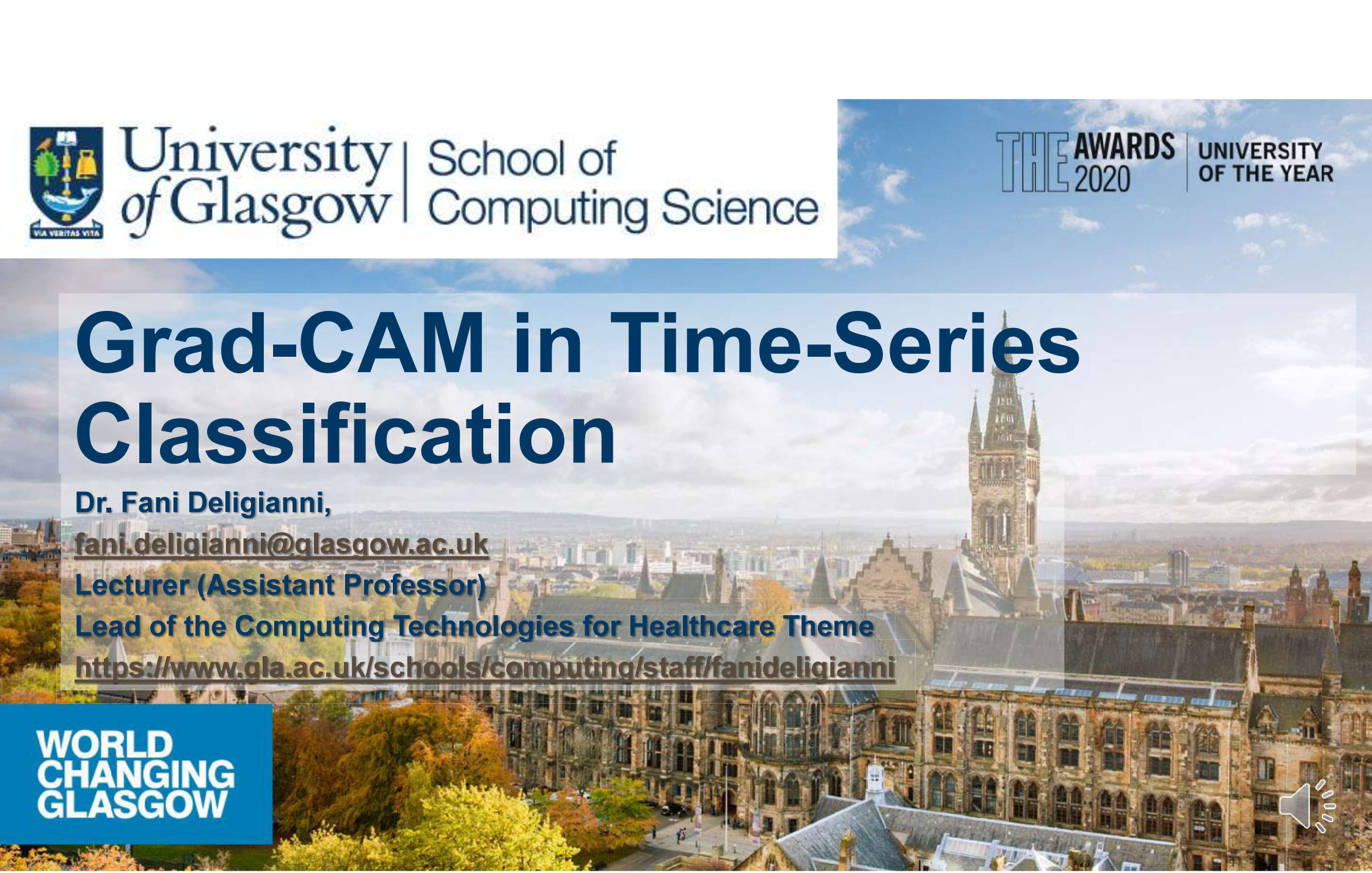
University of Glasgow | School of Computing Science

THE AWARDS 2020 | UNIVERSITY OF THE YEAR

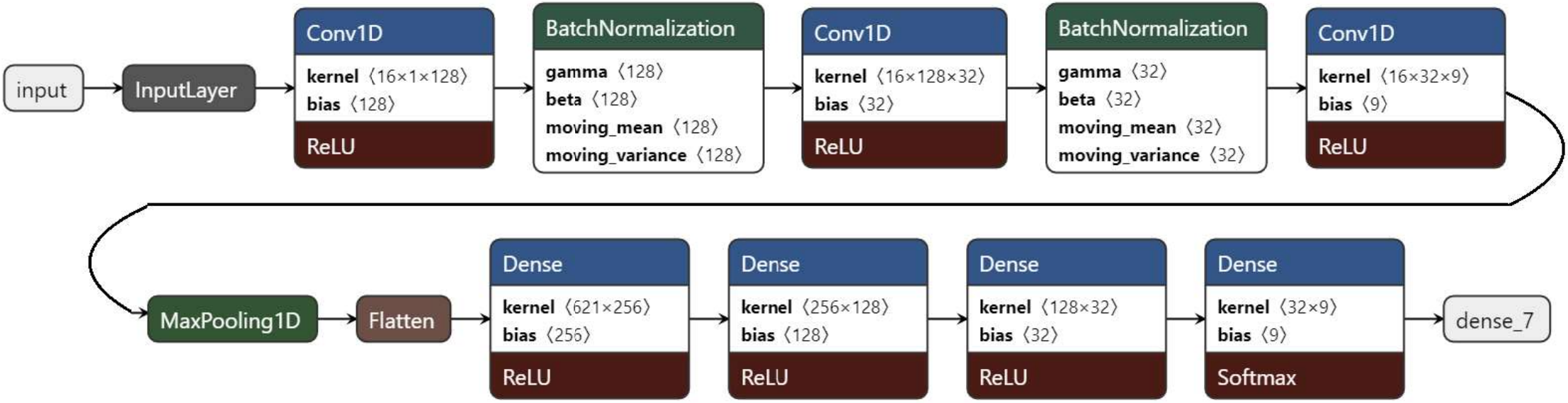
Grad-CAM in Time-Series Classification

Dr. Fani Deligianni,
fani.deligianni@glasgow.ac.uk
Lecturer (Assistant Professor)
Lead of the Computing Technologies for Healthcare Theme
https://www.gla.ac.uk/schools/computing/staff/fanideligianni

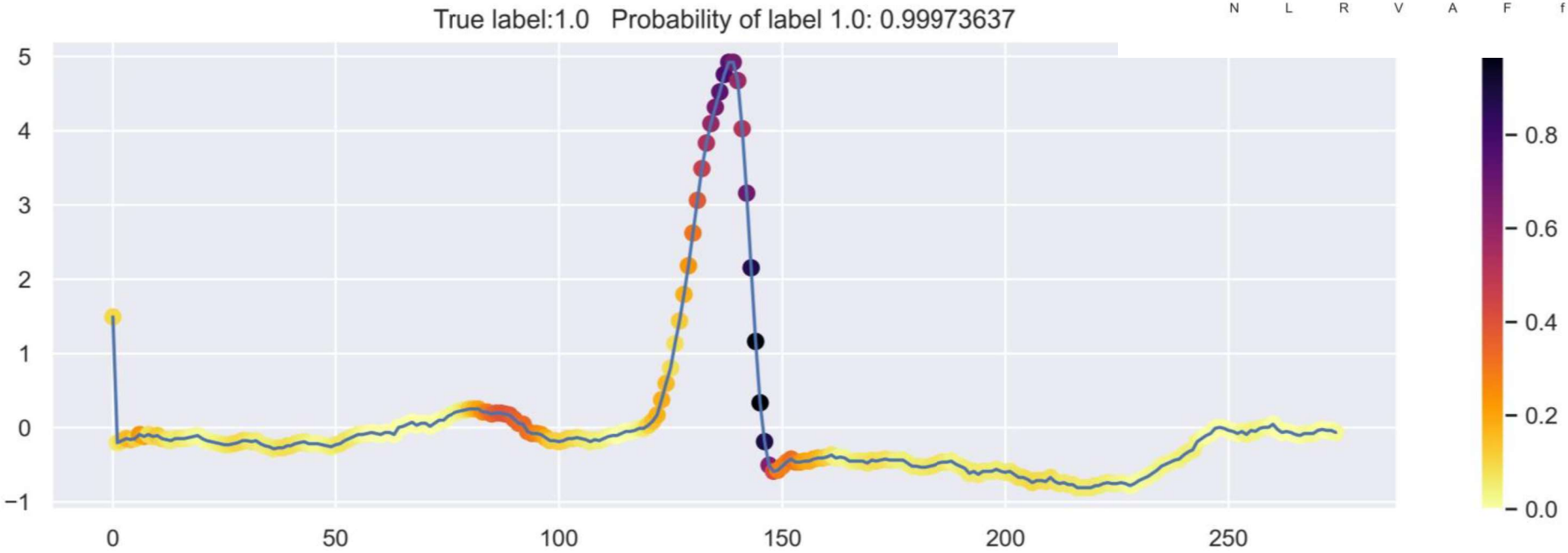
WORLD CHANGING GLASGOW



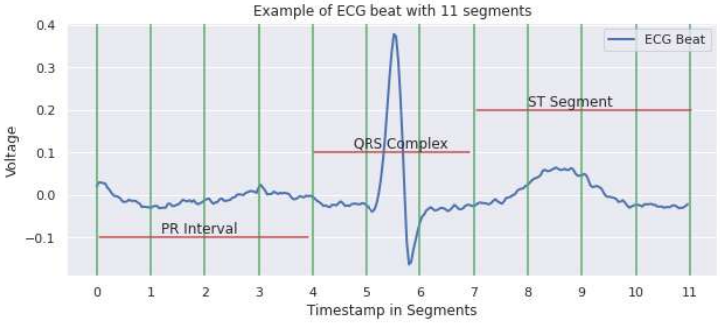
CNN Architecture



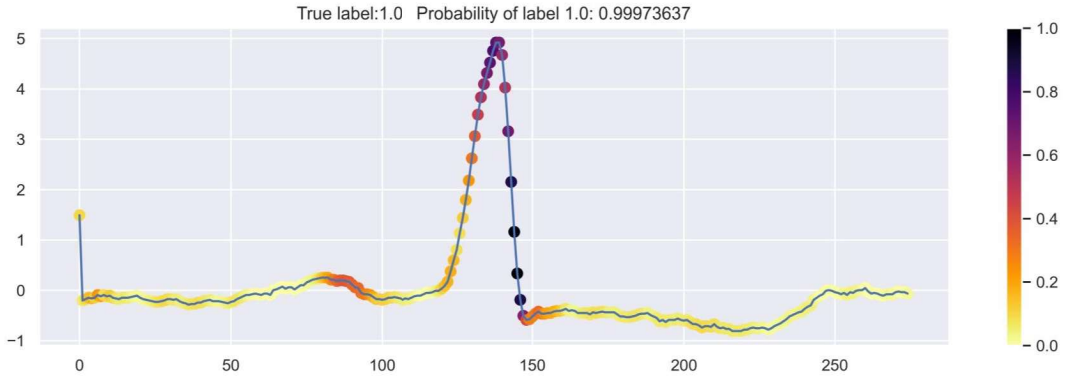
Grad-CAM Example



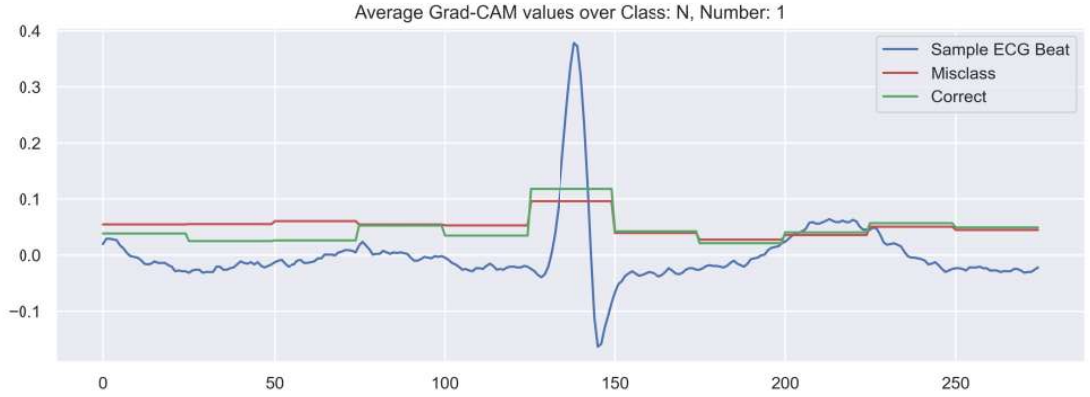
From Local to Global Explanations



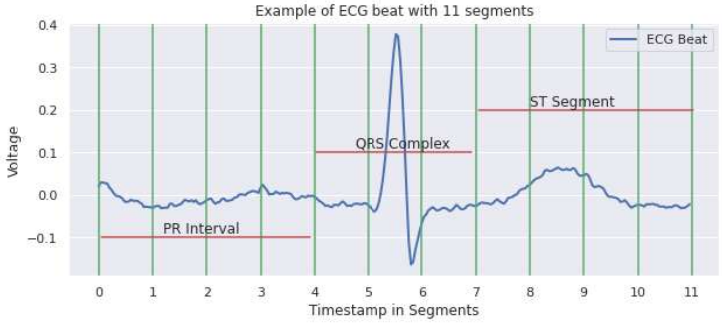
Single Beat

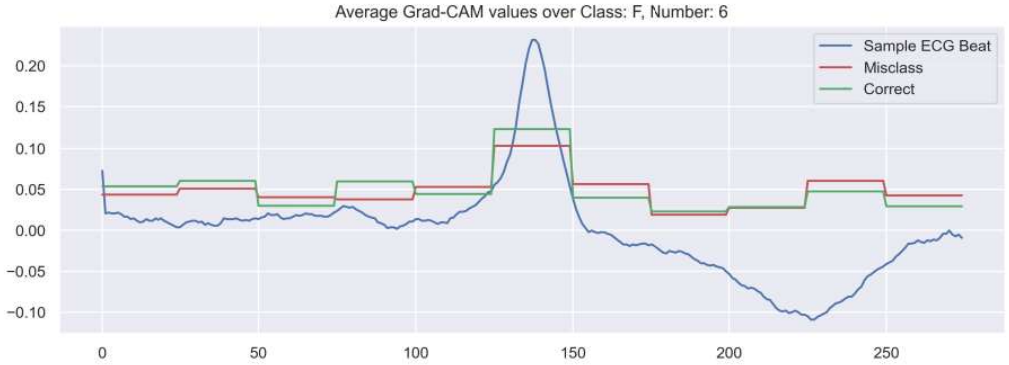


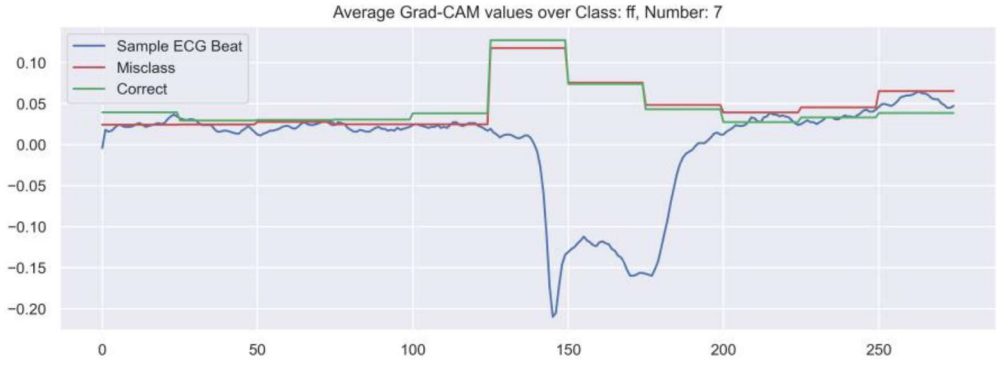
Average over class

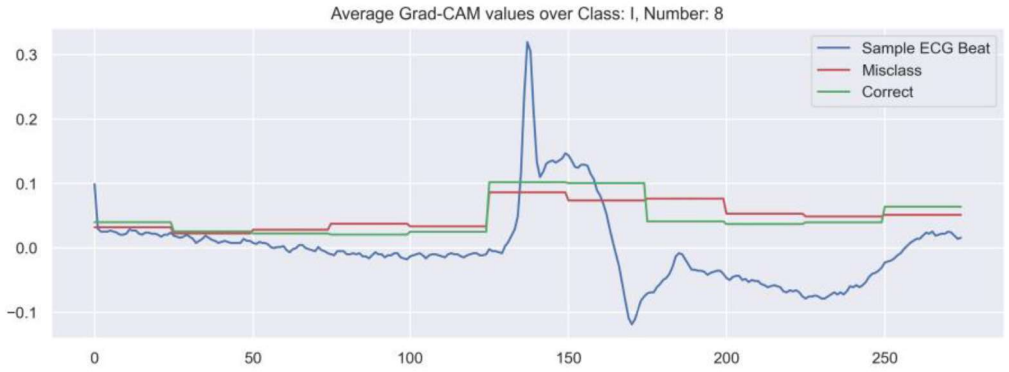


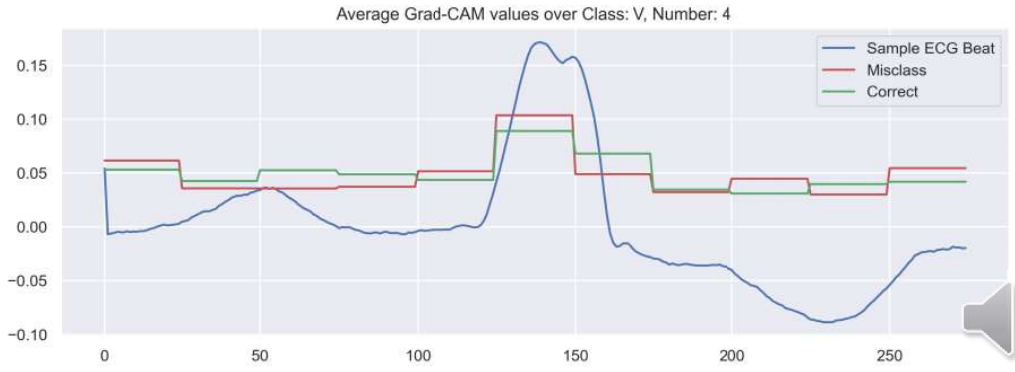
Average Explanations per Class



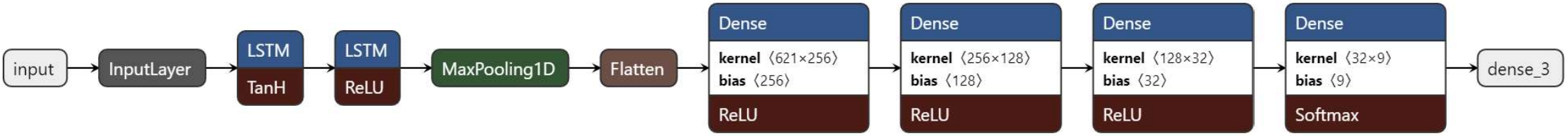




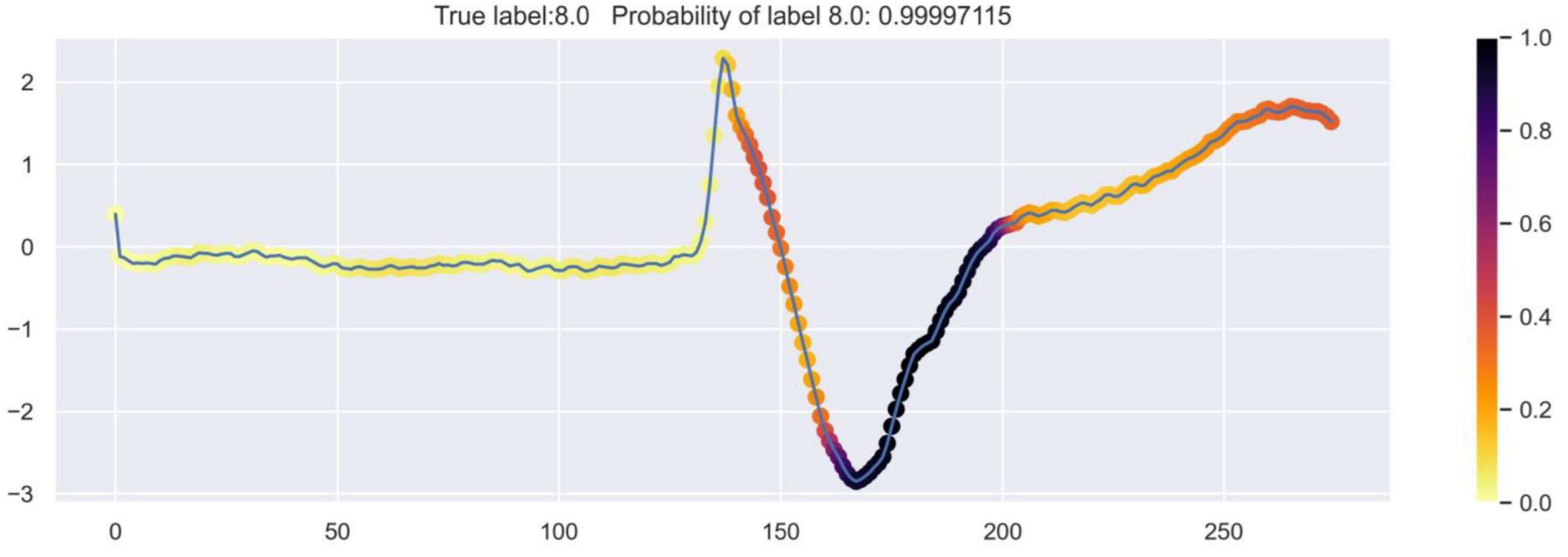




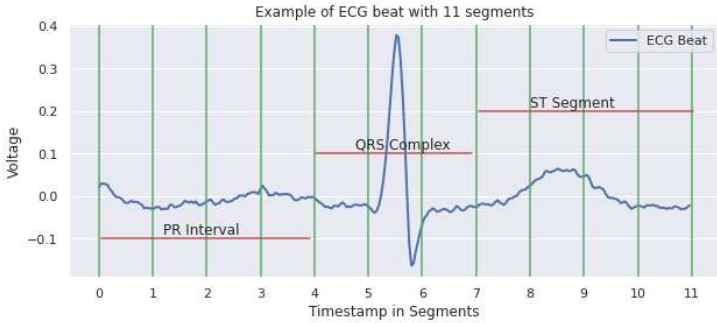
GRAD-CAM-based LSTM Visualisation

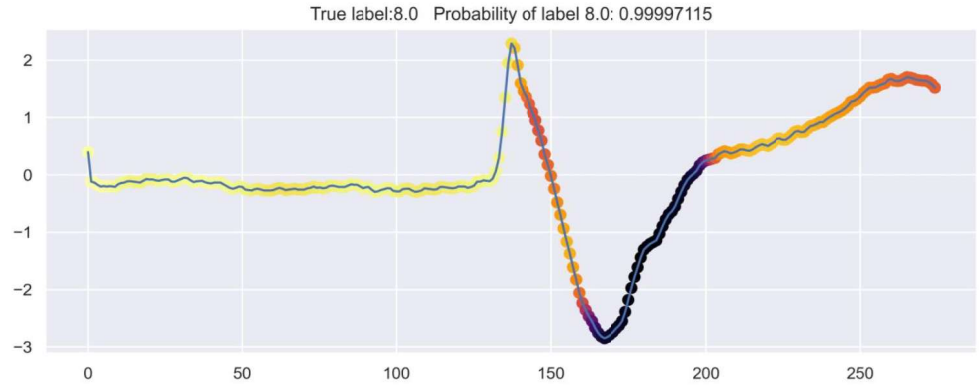


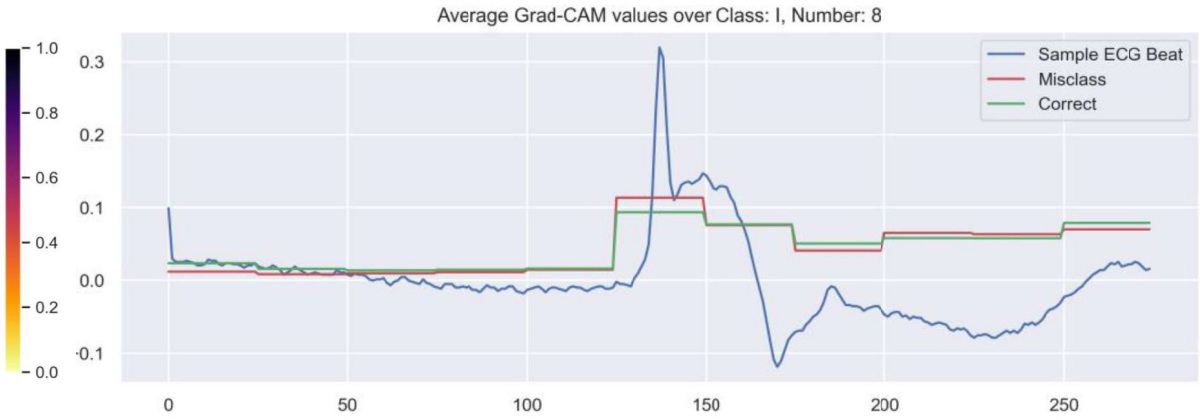
GRAD-CAM-based LSTM Visualisation



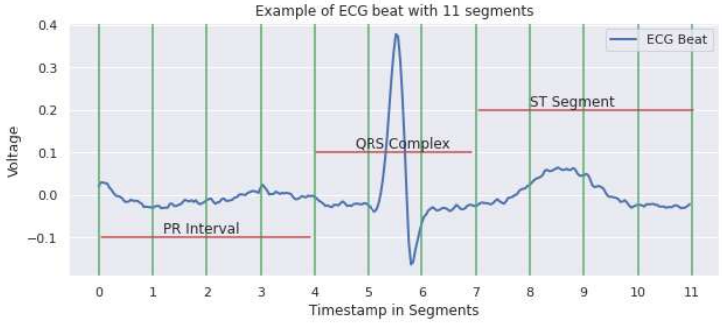
Average LSTM Heatmaps

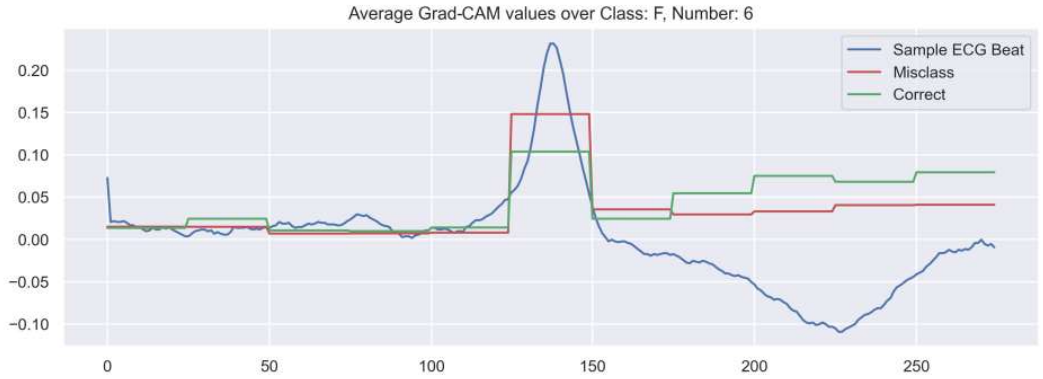


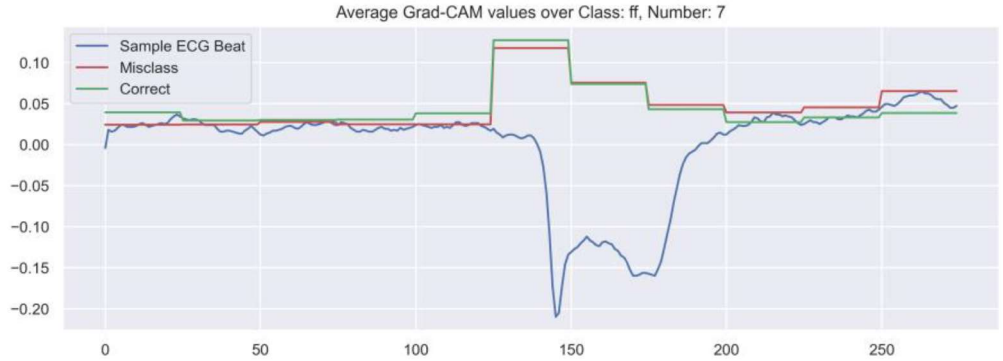


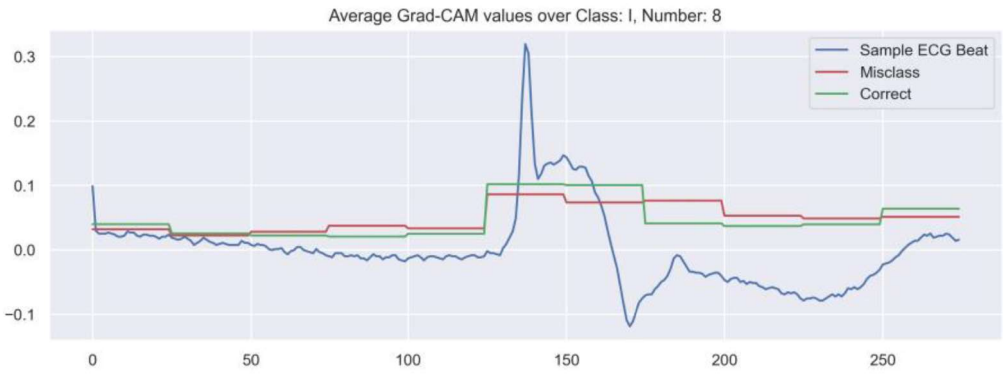


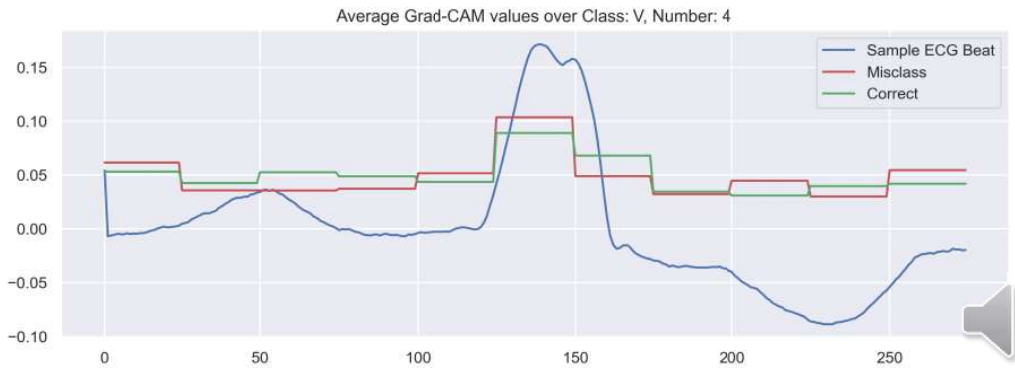
Average Explanations per Class











Summary

- Grad-CAM provided plausible explanations without the need to change the deep neural network architecture
- A variation of Grad-CAM has been applied to an LSTM model with convincing results
- Further work is needed to understand how explanations compare across different methods

References

- Zhou et al. ‘Learning Deep Features for Discriminative Localization’, CVPR, 2016.
- Selvaraju et al. ‘Grad-CAM: Visual Explanations from Deep Networks via Gradient-based Localization’, International Journal of Computer Vision, 2019.
- Wang et al. ‘Time Series Classification from Scratch with Deep Neural Networks: A Strong Baseline’, International Joint Conference on Neural Networks (IJCNN), 2017.
- Yola et al. ‘Improving ECG Classification Interpretability using Saliency Maps’, IEEE BIBE, 2020.