

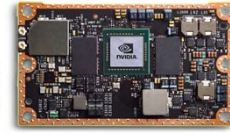
Introduction

Edge computing puts powerful processing power required for Artificial Intelligence (AI) and Machine Learning (ML) capabilities close to physical systems of interest (e.g. machines) and IoT sensors.

Communication costs and delays, and processing delays at the cloud back-end, are significantly reduced.

Connectivity to cloud for 'digital twin' and system-wide monitoring and optimization.

Edge AI (EA)-Hub

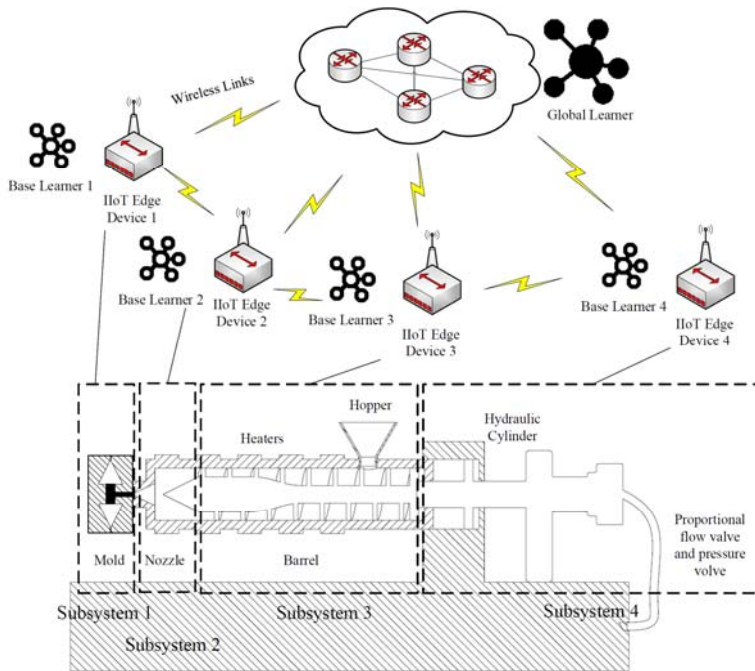


TensorFlow™

Graphics Processing Unit (GPU)-accelerated machine learning on EA-Hub with wireless networking

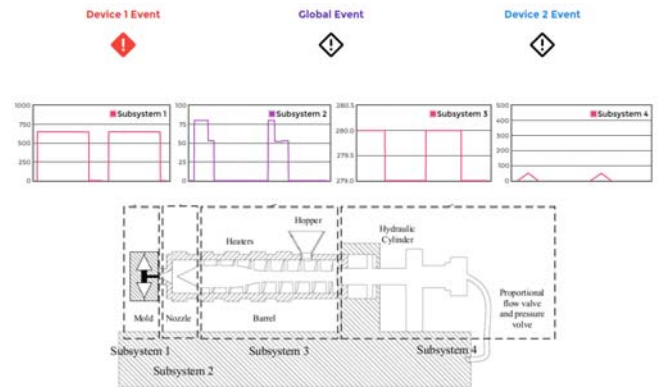
Machine State Prediction for Predictive Maintenance

Digital Twin on the Cloud for system-wide monitoring and optimization

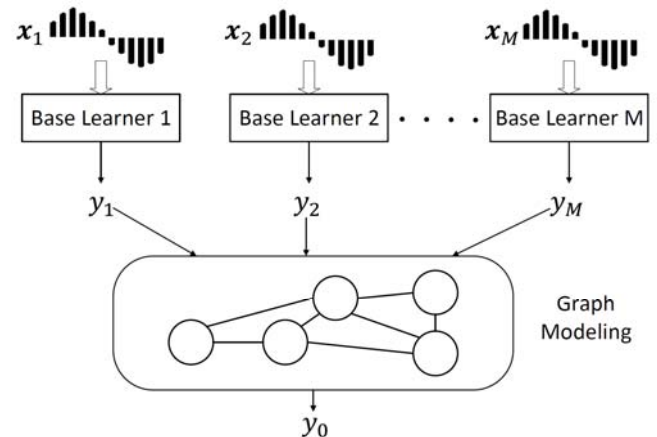


Injection molding machine instrumented with 4 groups of sensors which interface to Edge AI Hubs which perform sensor data analytics and machine state prediction in real-time

Dashboard



Ensemble Learning



Prediction Accuracy

CLASSIFICATION RESULTS USING INJECTION MOULDING DATA

Method	Accuracy	AUC-ROC	F1-score
KNN-SA	0.8103	0.8127	0.8379
KNN-WA	0.8568	0.8573	0.8625
KNN-NCLWA	0.8916	0.8917	0.8860
KNN-GEL	0.9118	0.9117	0.9092
DT-SA	0.8807	0.8656	0.7932
DT-WA	0.9101	0.9030	0.8619
DT-NCLWA	0.9243	0.9221	0.9155
DT-GraphEL	0.9781	0.9781	0.9775
SVM-SA	0.5227	0.5158	0.5105
SVM-WA	0.5315	0.5244	0.5200
SVM-NCLWA	0.5408	0.5353	0.5218
SVM-GraphEL	0.5539	0.5530	0.5328
MLP-SA	0.8420	0.8385	0.8155
MLP-WA	0.8805	0.8788	0.8695
MLP-NCLWA	0.8884	0.8887	0.8864
MLP-GraphEL	0.9081	0.9029	0.9004

CLASSIFICATION RESULTS USING TURBOFAN ENGINE DATA

Method	Accuracy	AUC-ROC	F1-score
KNN-SA	0.8331	0.8336	0.8327
KNN-WA	0.8767	0.8770	0.8749
KNN-NCLWA	0.8912	0.8914	0.8893
KNN-GraphEL	0.9111	0.9112	0.9091
DT-SA	0.8497	0.8500	0.8486
DT-WA	0.8984	0.8987	0.8965
DT-NCLWA	0.9197	0.9200	0.9183
DT-GraphEL	0.9329	0.9331	0.9314
SVM-SA	0.8255	0.8900	0.8291
SVM-WA	0.8319	0.8960	0.8356
SVM-NCLWA	0.8573	0.9033	0.8630
SVM-GraphEL	0.8606	0.9161	0.8656
MLP-SA	0.5473	0.5478	0.5104
MLP-WA	0.5521	0.5538	0.5548
MLP-NCLWA	0.5597	0.5612	0.5673
MLP-GraphEL	0.5717	0.5731	0.5815