

12th IAMC meeting
Tsukuba, December 2nd

Methodological Issues

A World
Leading SFI
Research
Centre



Application of Custom Neural Networks in Transport Sectors Energy Service Demand Estimation for SSPs

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HOST INSTITUTION



PARTNER INSTITUTIONS



FUNDED BY:



- To generate Energy Service demands for Transport Sector
- The Generated Energy Service demands will feed into CHIMERA Project to build a global energy model using TIMES framework



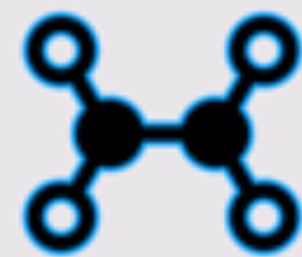
- Leverage DeepLearning architectures to mitigate the problem of non-constant variance and limited data points
- Generate Physical demands to incorporate efficiencies during model runs

Concepts



Results

Implementation



Key Takeaways

CONCEPTS

MAPPING PHYSICAL PROCESS TO VIRTUAL DOMAIN

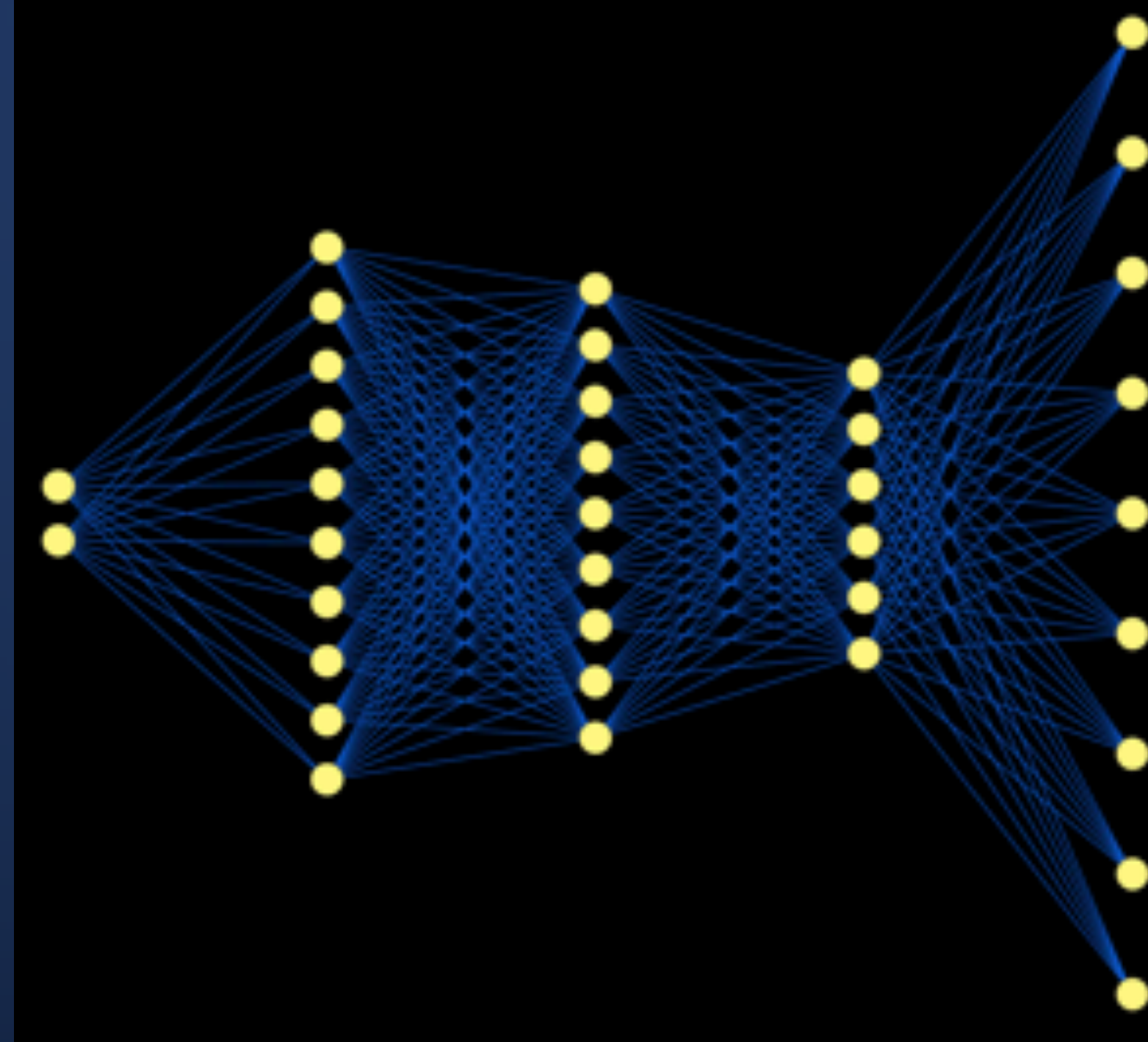
PHYSICAL PROCESS

TREBUCHET LEARNING AND FIRING

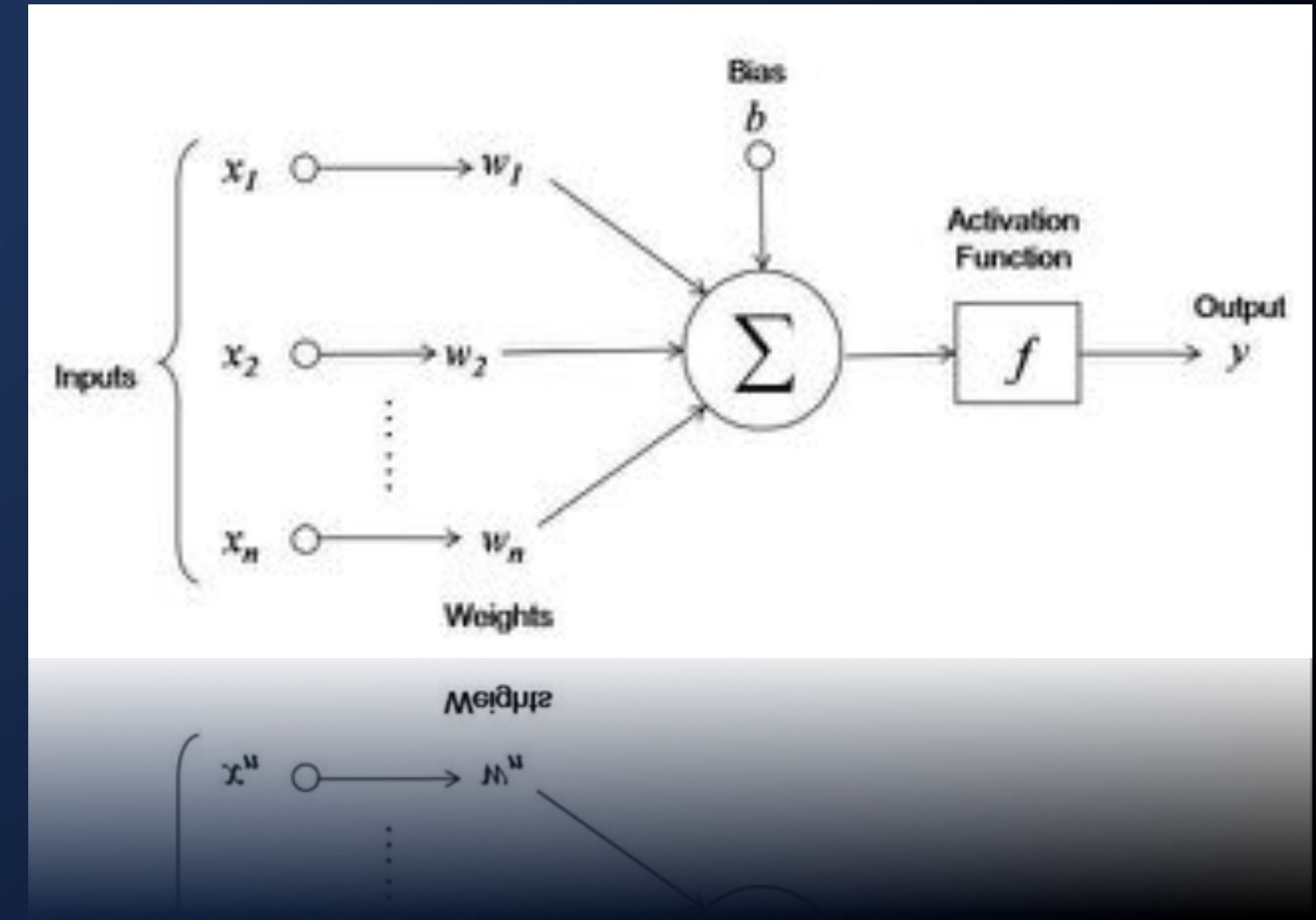
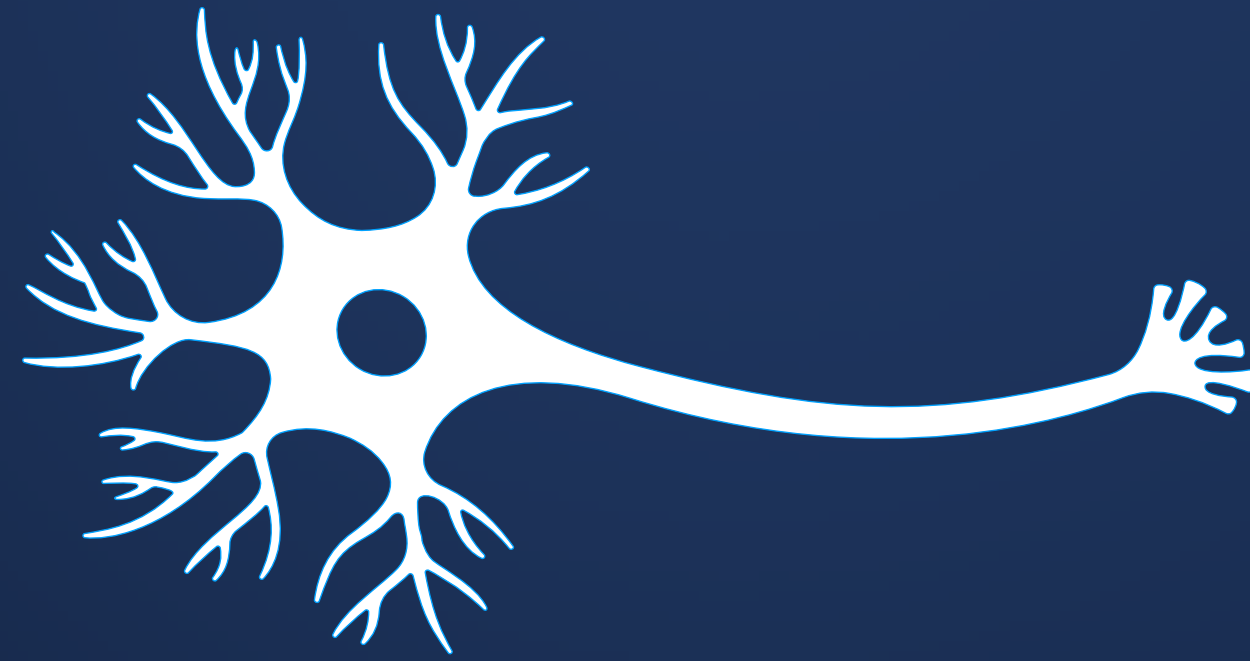
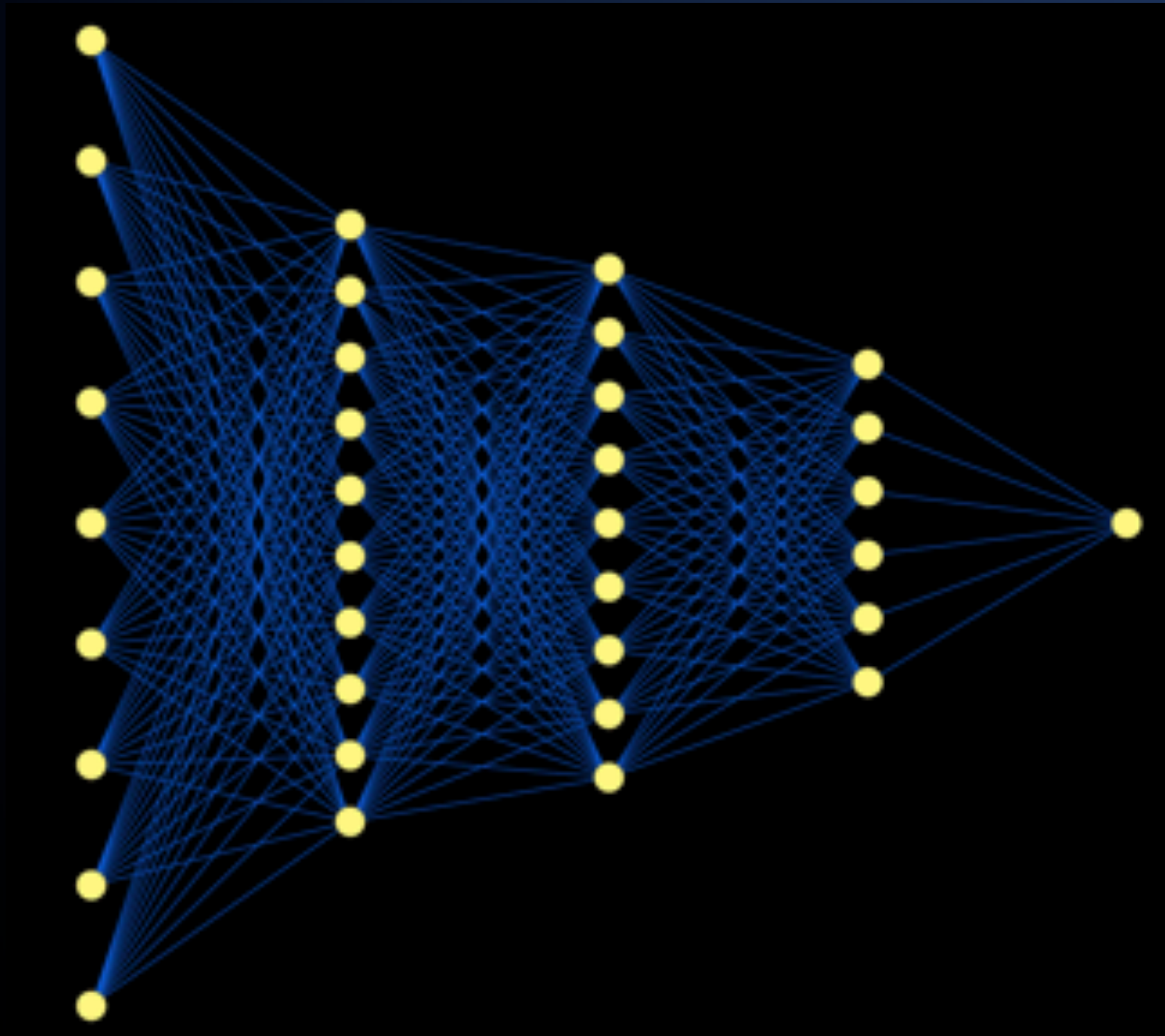




LEARNING PHASE



FIRING PHASE



IMPLEMENTATION

TREBUNET

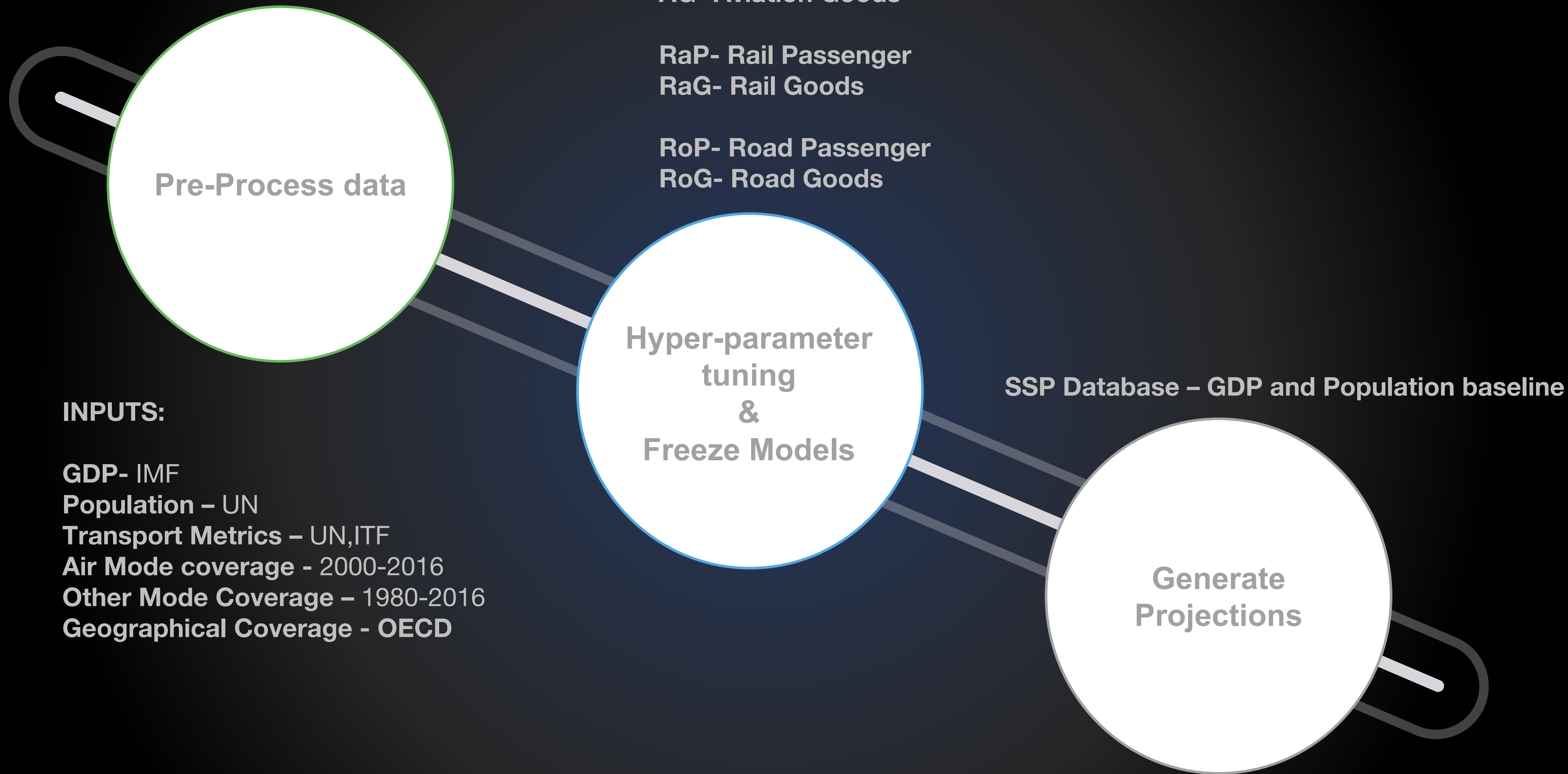
Generate Higher dimensional metric for each data point i.e. quantile prediction for each data point

Architecture automatically choses the best quantiles to project on



IMPLEMENTATION

METHODS

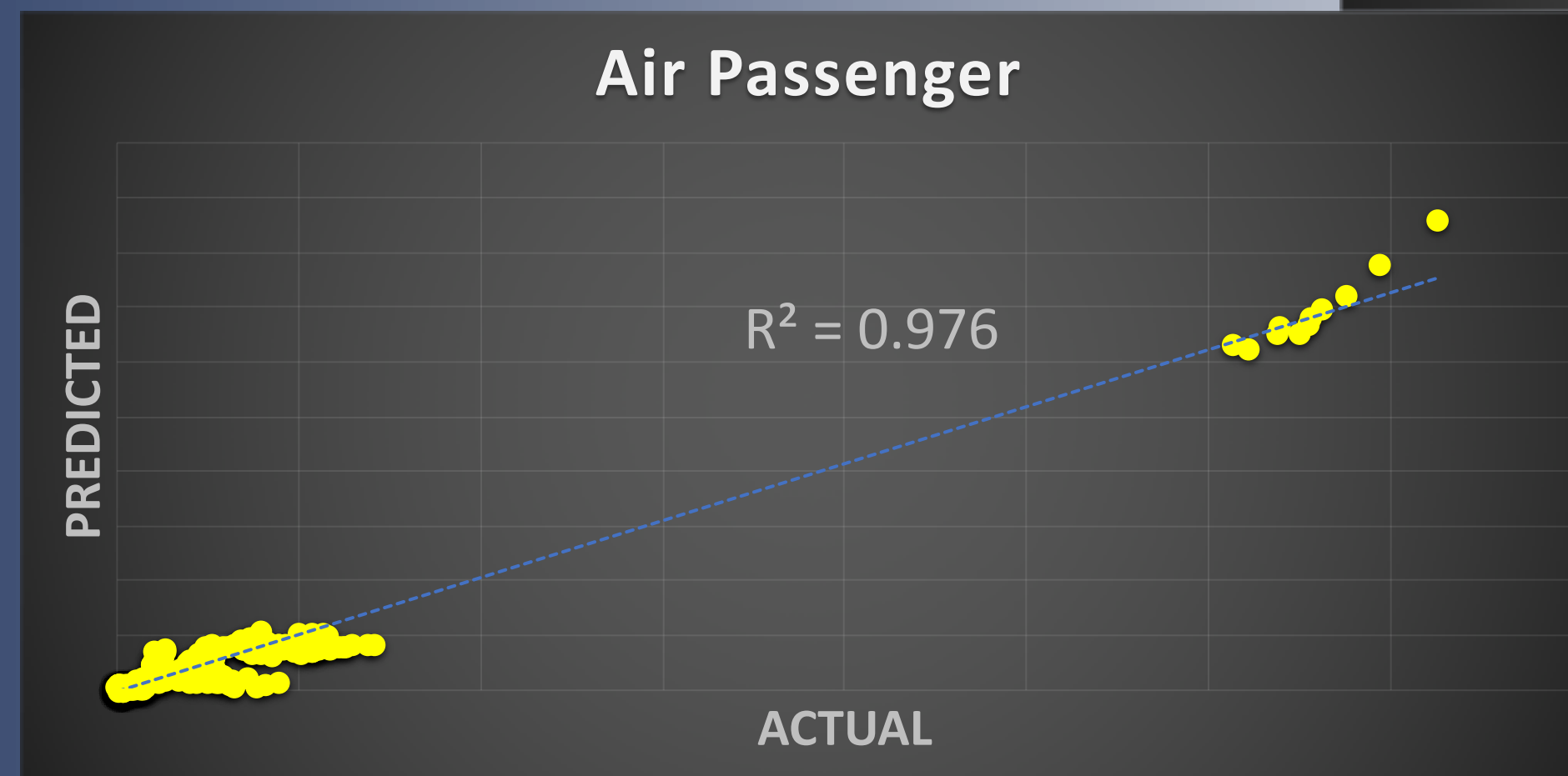
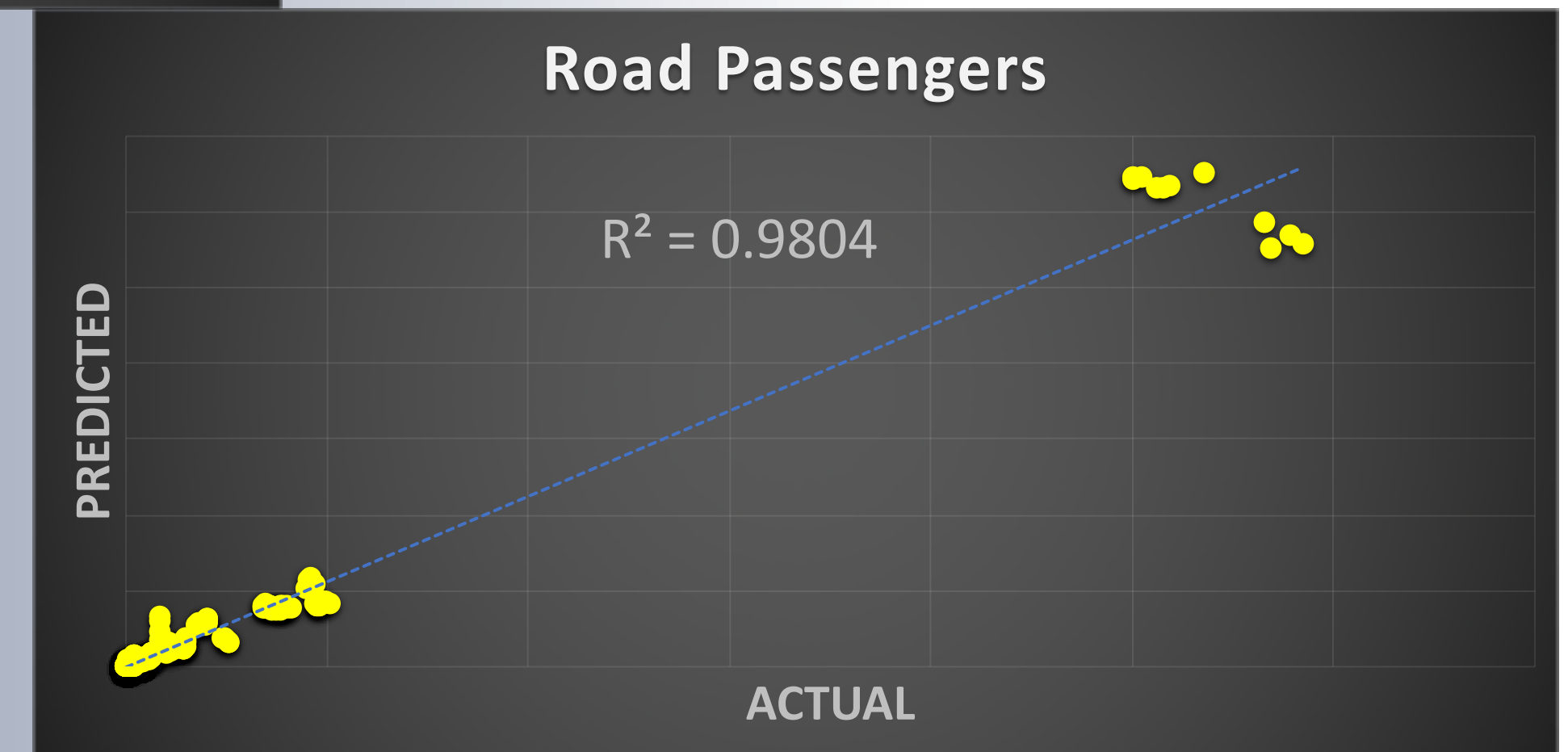
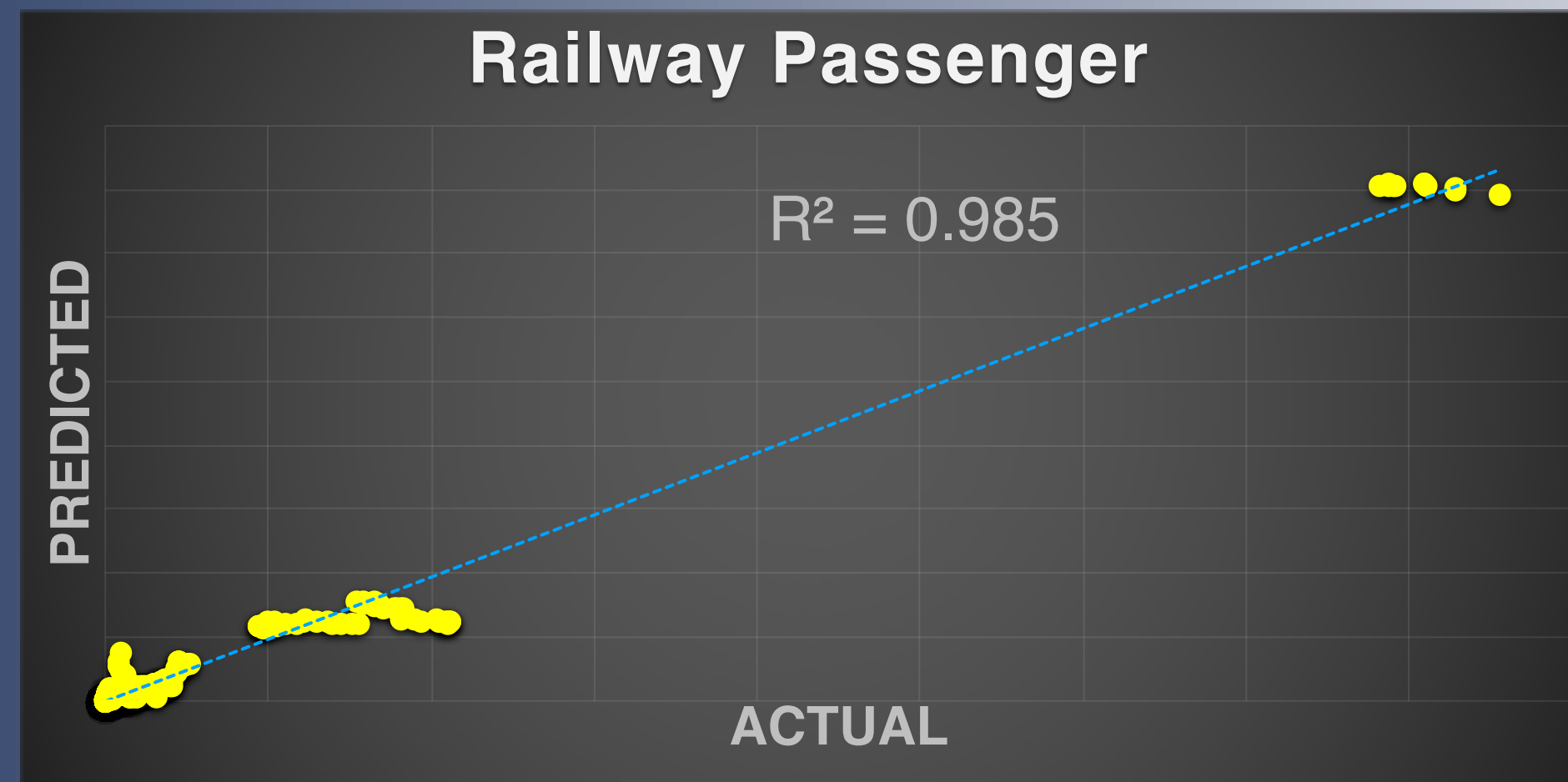


RESULTS

HISTORICAL LEARNING

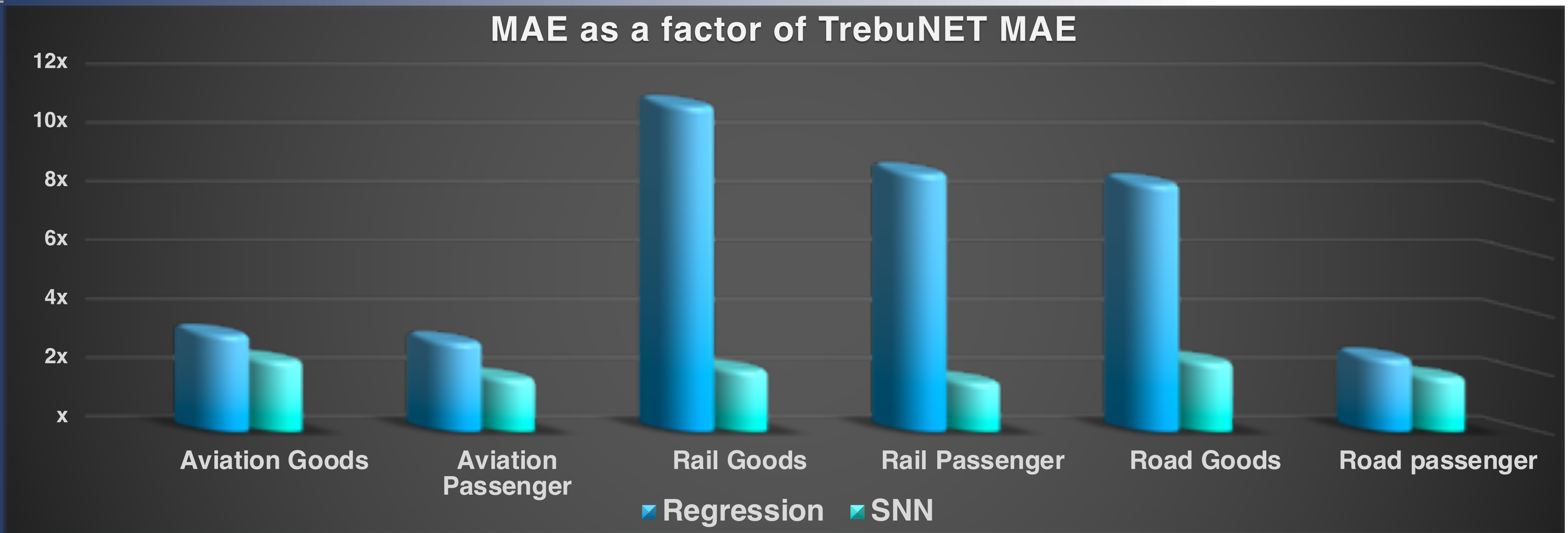
TESTING LEARNING POTENTIAL

LEARNING TILL 2005,
PROJECTING TILL 2015



TESTING LEARNING POTENTIAL

TILL 2015

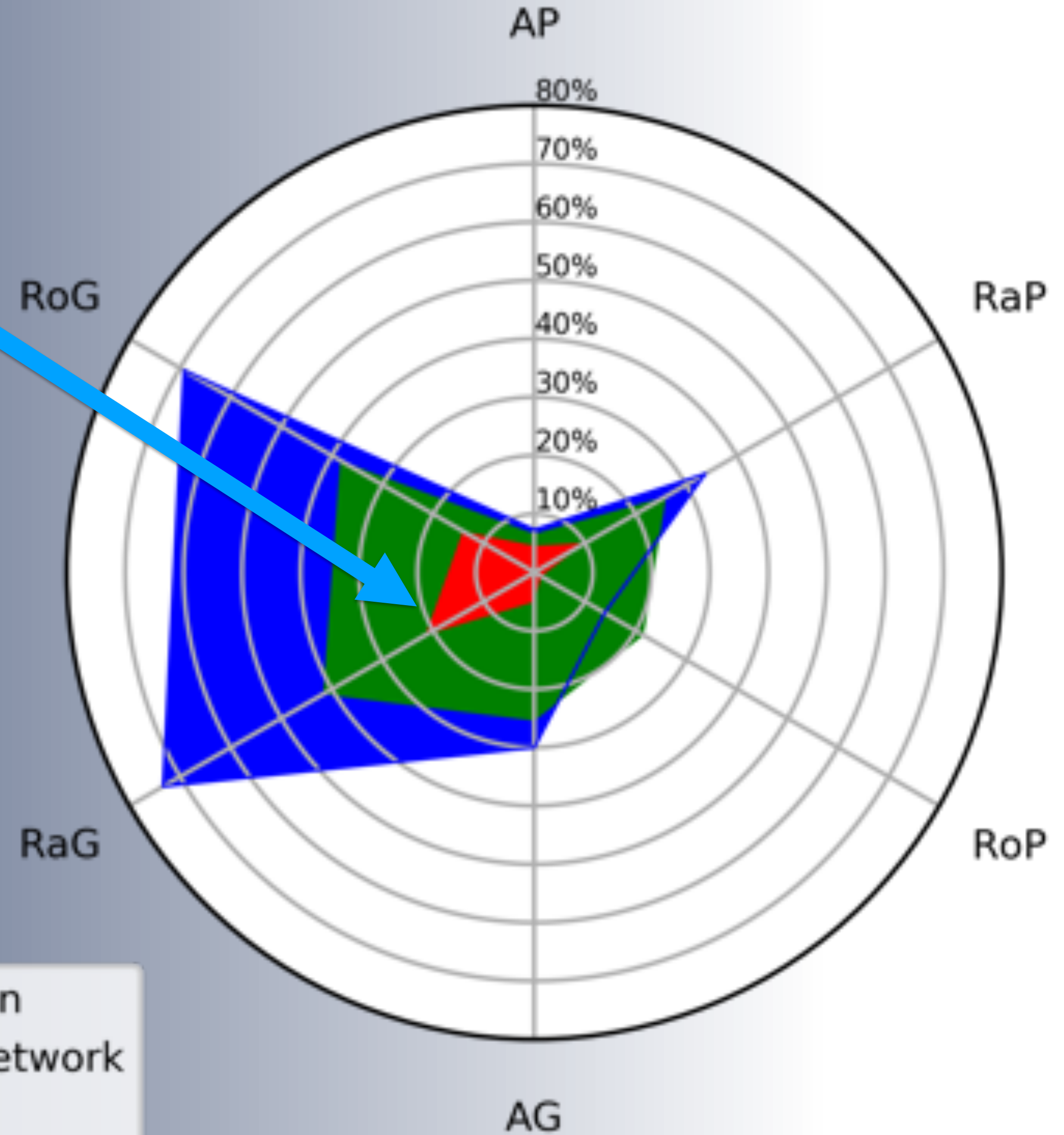
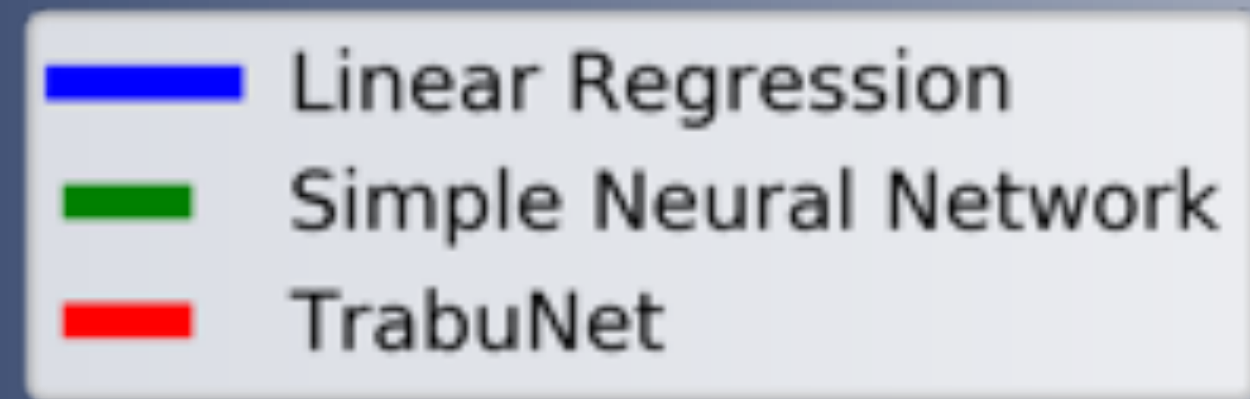


RESULTS

ONE YEAR SHORT TERM PROJECTION FOR YEAR 2016

TESTING LEARNING POTENTIAL

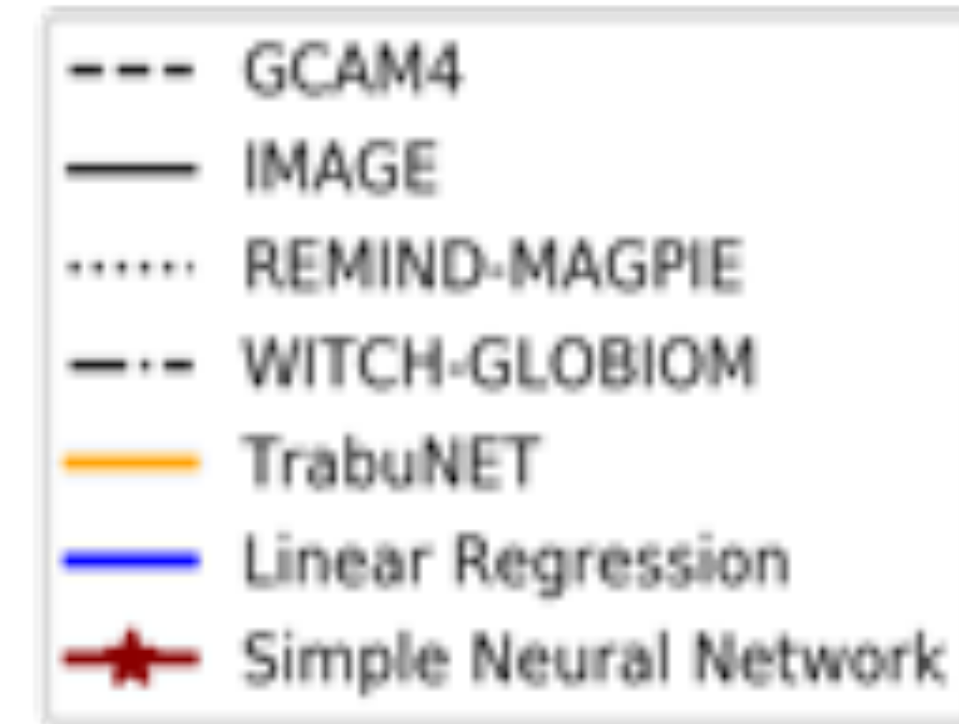
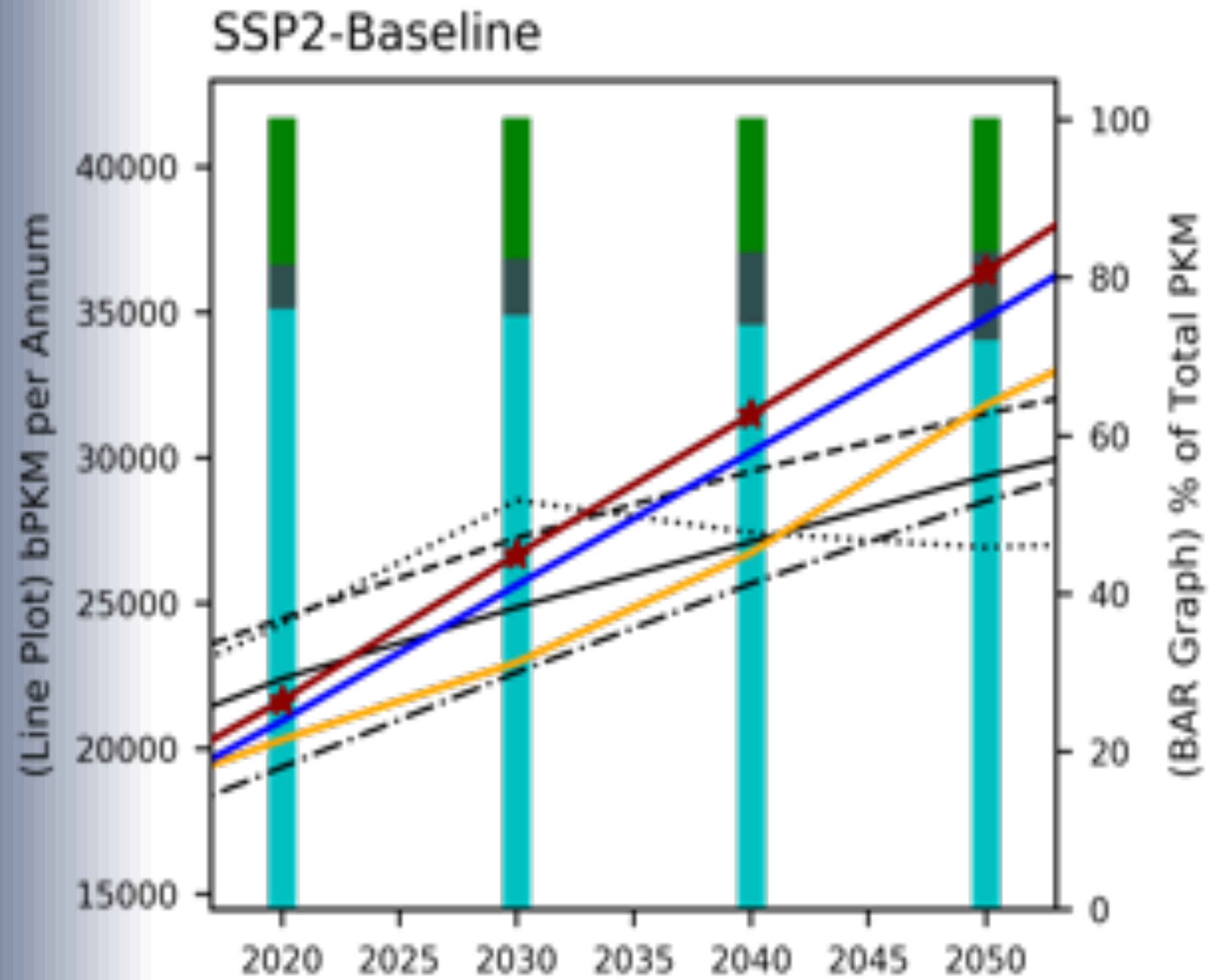
**ABSOLUTE PERCENTAGE ERROR
IN PREDICTING RESPECTIVE
DATA-SERIES USING TRAINED
MODEL OVER 2016 DATA-POINTS**



RESULTS

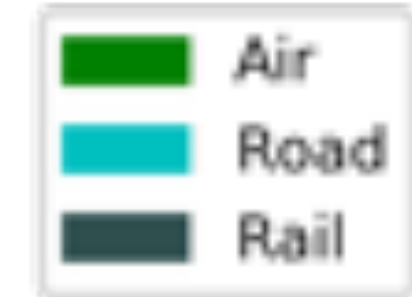
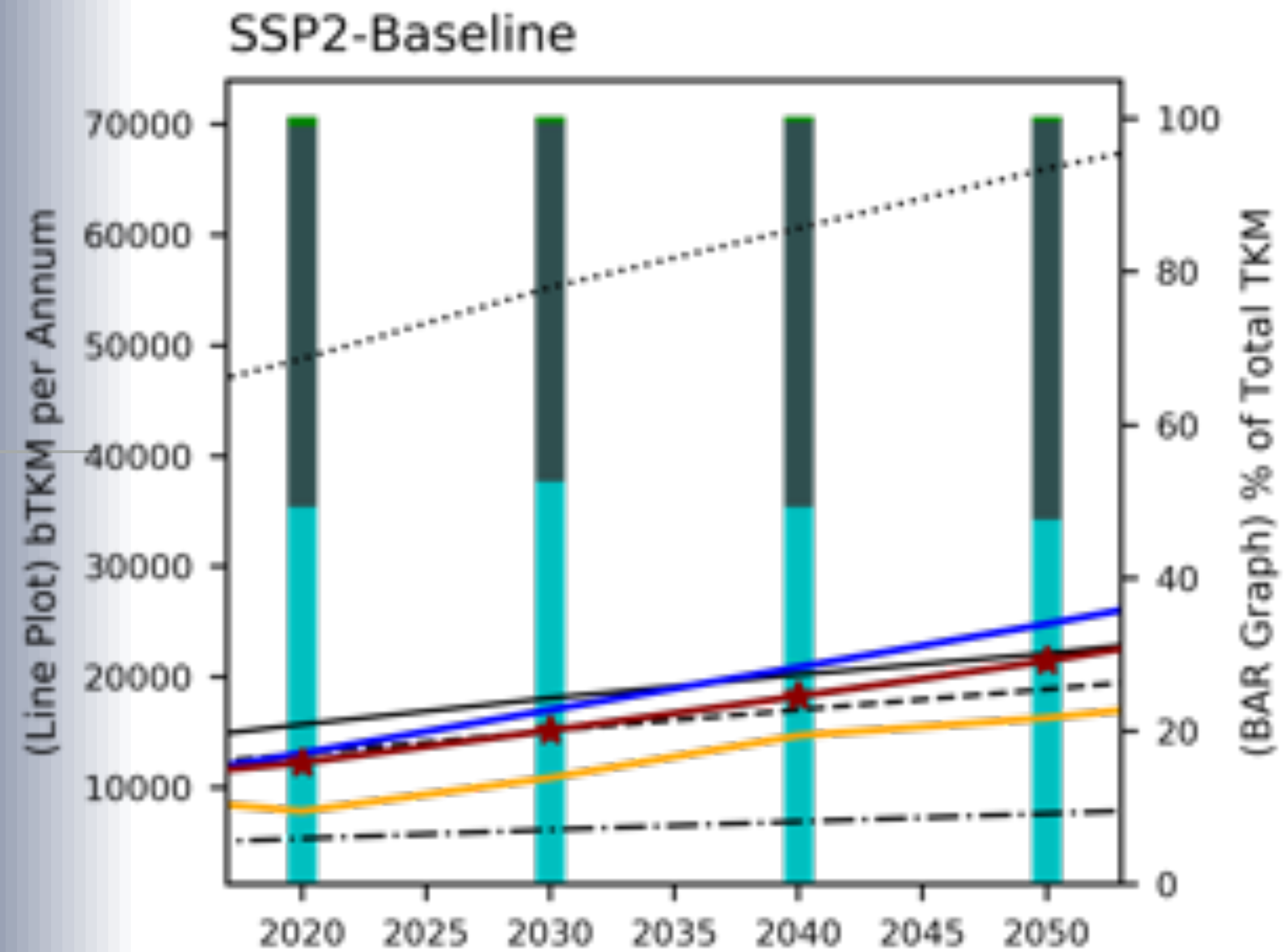
OECD TRANSPORT DEMAND PROJECTIONS (2020–2050)

SSP-2 PROJECTIONS PASSENGER



SSP-2 PROJECTIONS

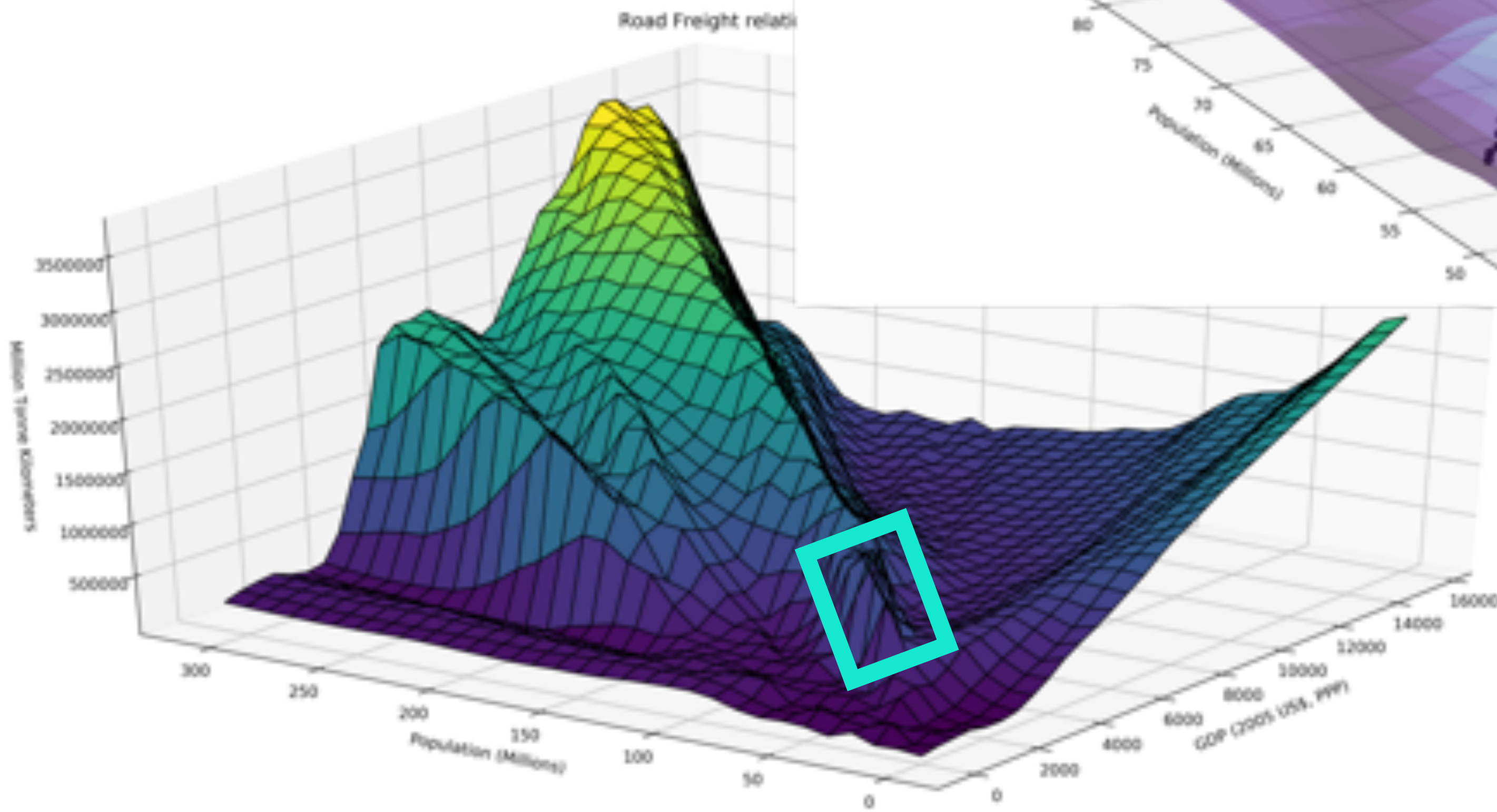
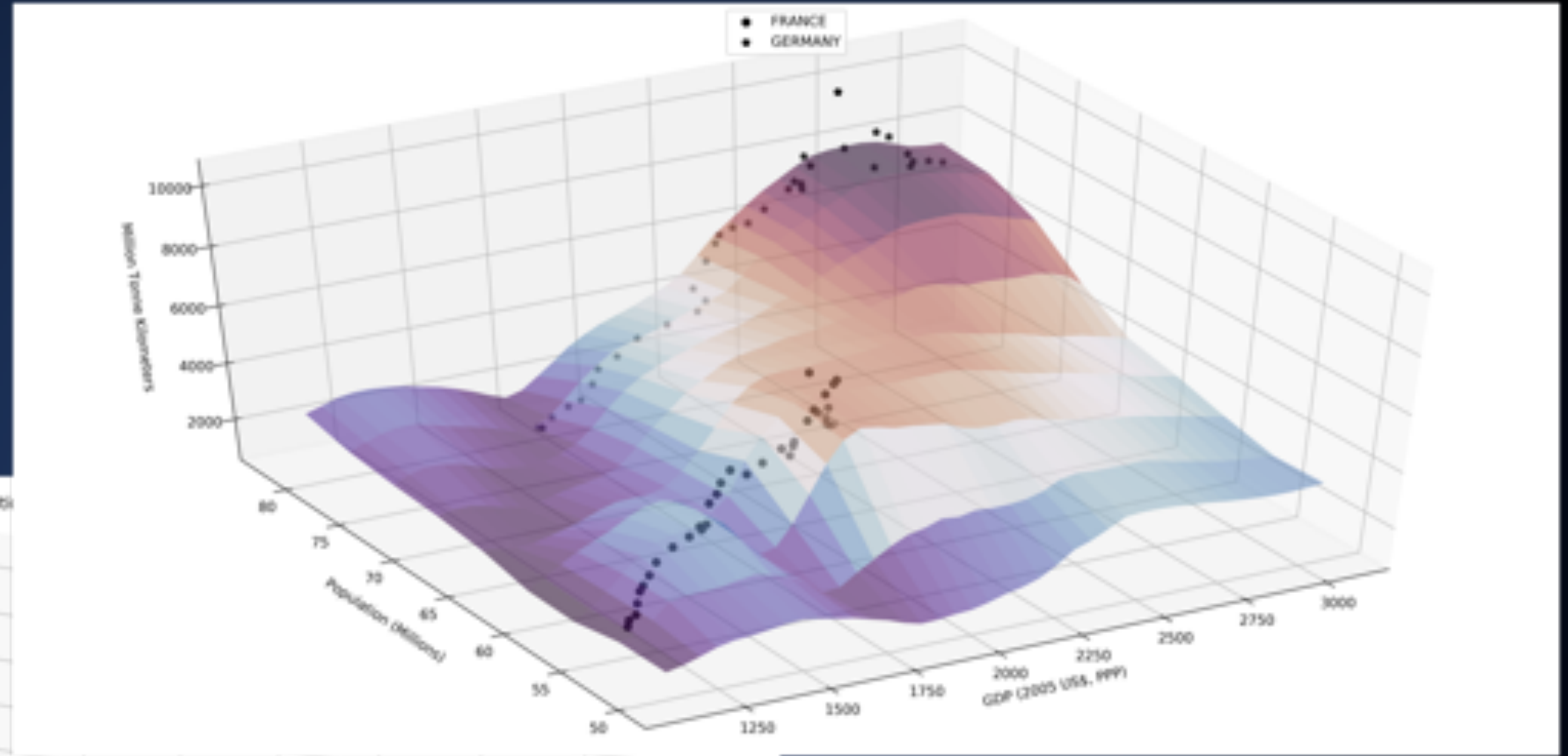
FREIGHT



RESULTS

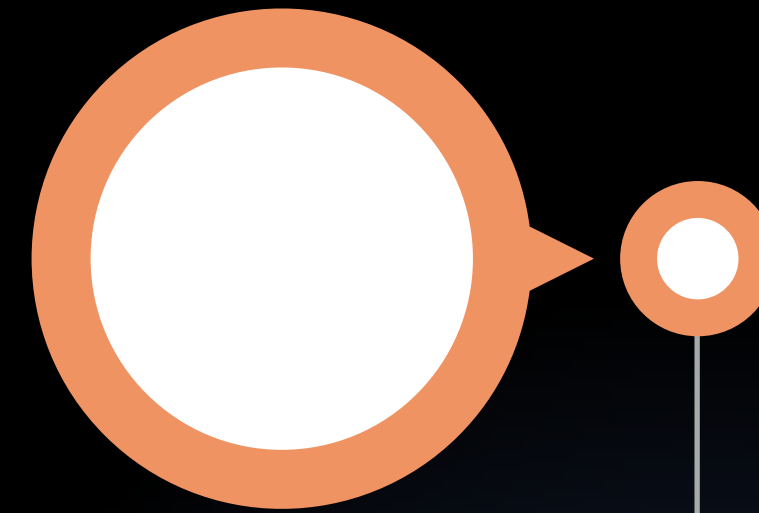
IT'S A "BLACK BOX" !

RELATIONSHIP SURFACE



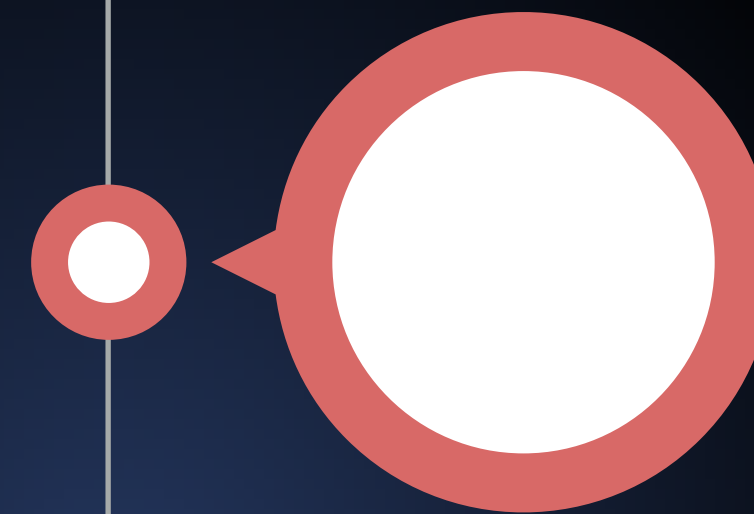
KEY TAKEAWAY

SUMMARY

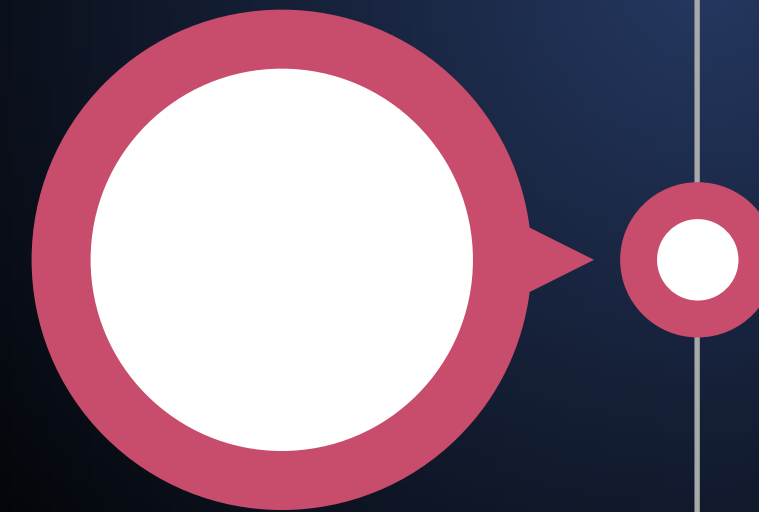


Substantial improvement in results over linear regression

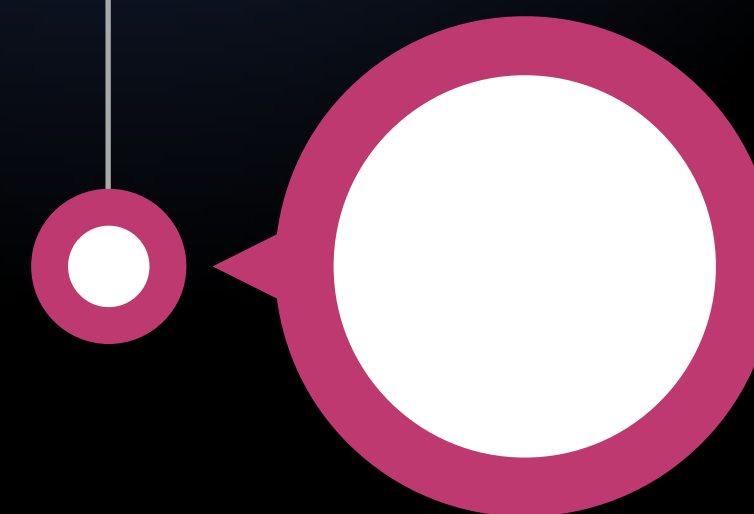
Capturing of non linear behaviour inside neural networks



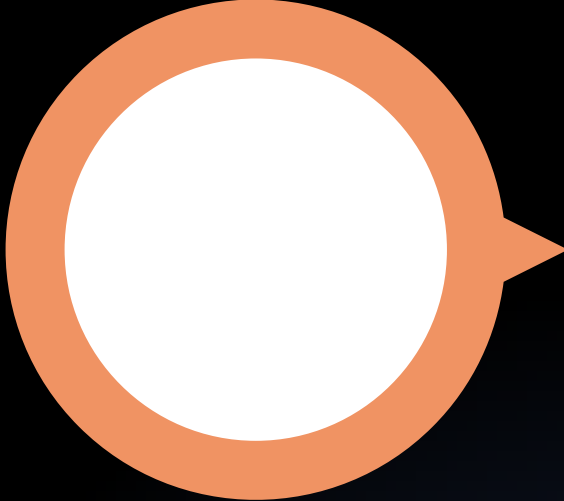
Method applicable for non constant variance data series



New Method that improves upon a rudimentary Neural network architecture

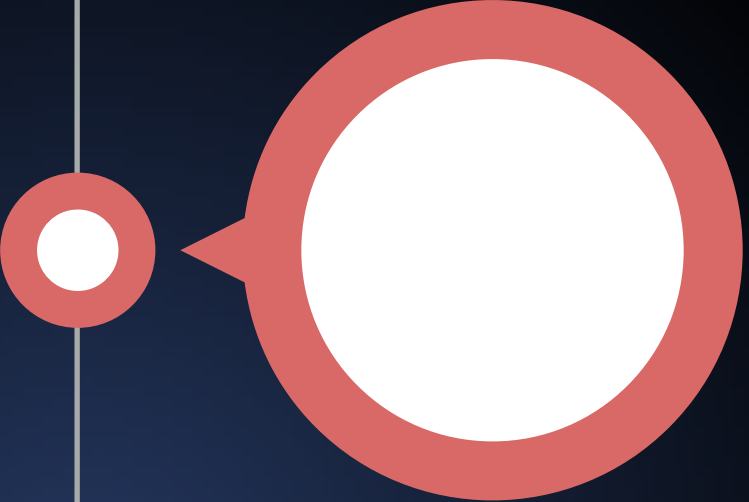


Can be applied to other sectors also e.g. Residential, Industrial energy Service Demands

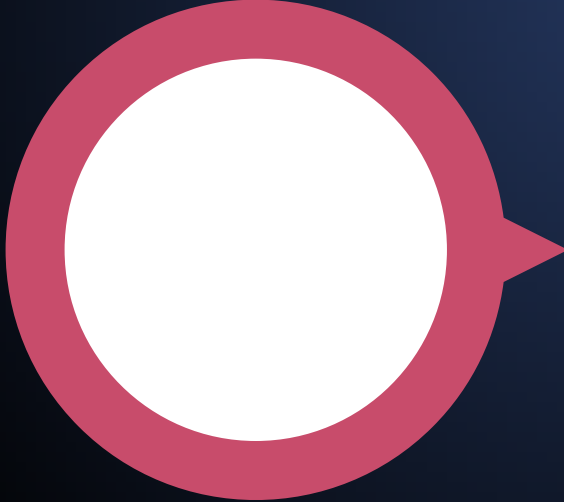


Manuscript prepared

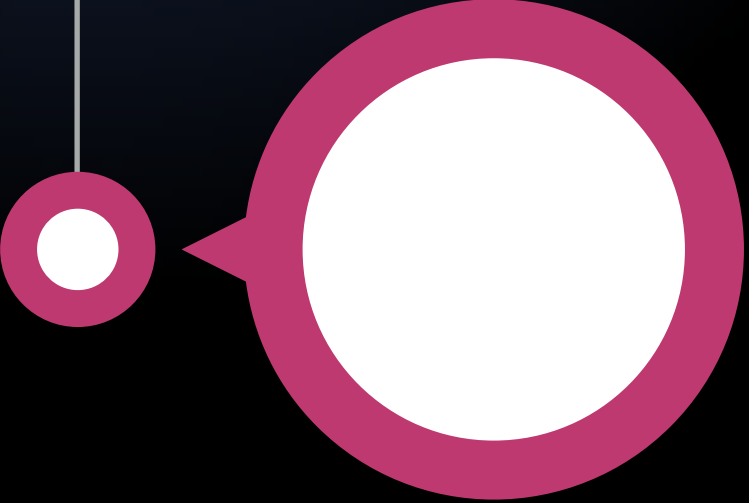
Generate transport demand for global maritime freight using GIS and DeepLearning



Expanding Transport demand to cover global 31 regions



Seeking Internship and collaboration opportunities to explore energy modelling and AI interface



THANK YOU

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