A Brief Survey on Deep Learning in Traffic Forecasting & Traffic State Estimation

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INTRODUCING MYSELF

- **My name is Zhengyou HAN(韩政佑), and please call me Alex**
- **I am a M1 student from Ito's Lab.**
  - **Ito's Lab is affiliated to Social ICT Research Center**
  - **We focus on Intelligent Transportation System studies(ITS)**
- **My current research theme is traffic prediction and estimation**
- **Graduated from the University of Illinois at Urbana-Champaign**
- **Hobbies: trying new games(video games, card games, board games…); Computer Graphics; reading books(novels, conference papers, blogs, my students' love letters…) in a bean bag with 1L size coke.**

Traffic State Estimation(TSE)& DL

- What is TSE?
- History
  - Model-based methods
    - LWR, ARZ models
  - Data-driven methods
    - STGCN, DCRNN
  - Hybrid methods
    - PIDL-FDL, STDEN

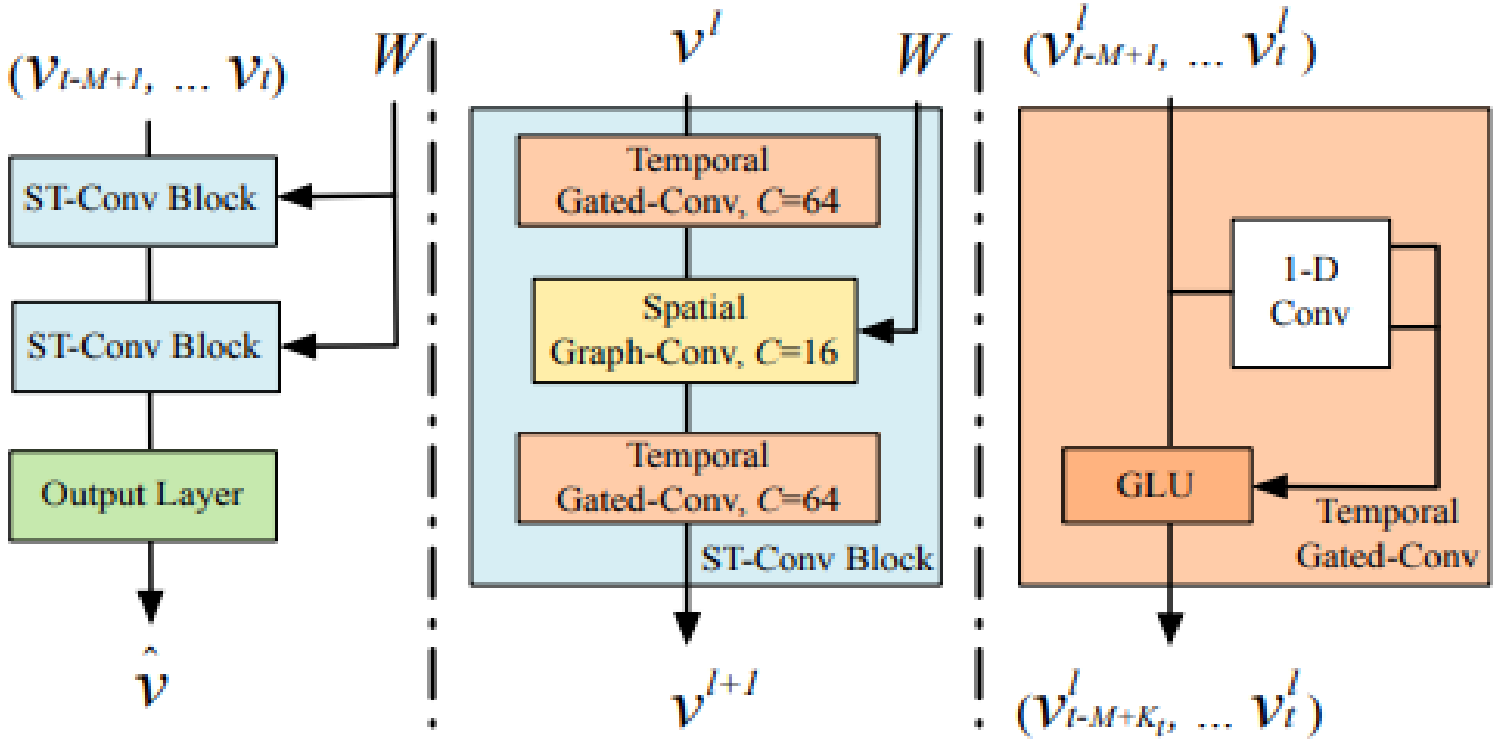
Traffic Forecasting & DL

- What is Traffic Forecasting?
  - To predict, based on data we have
- What is forecasting like before?
  - 1960s: linear models (Stone age)
  - 1970s-1990s: statistical models, e.g. ARIMA (Dark ages)
  - 2000s: machine learning(Industrial Revolution)
  - 2010s-Present: Deep learning(iphone4)

GNNs in traffic forecasting

- Graph Neural Networks(GNNs)
  - Why GNNs is chosen?
    - Traffic network are naturally graphs
    - Features in Non-Euclidean Space
    - One of the first attempt:
      - Shahsavari et al., *Short-term traffic forecasting*, 2015
    - A famous baseline method:
      - Yu et al. spatial-temporal graph convolutional network (STGCN), 2017

SPATIAL-TEMPORAL GRAPH CONVOLUTION NETWORKS(STGCN)



FUTURE DIRECTION

Interpretability

FUTURE RESEARCH DIRECTION

Kolmogorov-Arnold Networks(KANs)

KOLMOGOROV-ARNOLD NETWORKS(KANS)

- Based on Kolmogorov-Arnold Representation Theorem(KART)
- Why now?
- Controversial? Why?
- What about now?
  - GraphKAN & Temporal-KAN(or TKAN)