Large Language Model (LLM) for Networking: an Architecture

IETF 119 @ Brisbane

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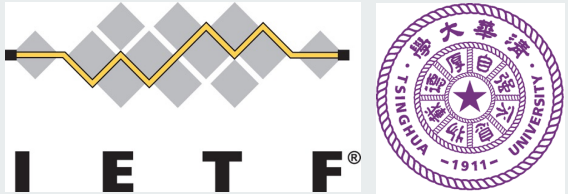
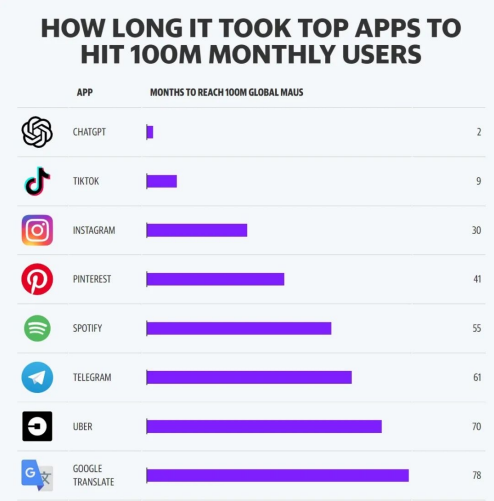
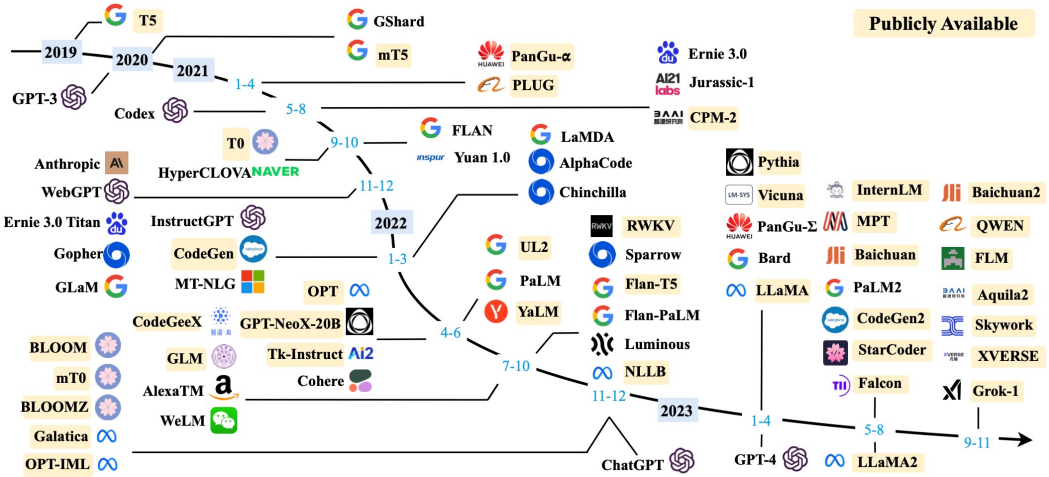


Background

- The emergence of ChatGPT has marked the beginning of a rapid development era for the large language model (LLM) and the generative AI



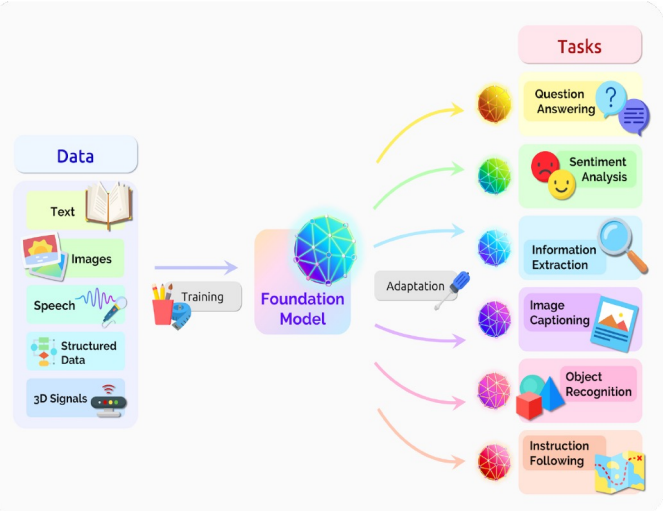


[1] finance.yahoo. ChatGPT on track to surpass 100 million users faster than TikTok or Instagram

[2] Wayne Xin Zhao et al. A Survey of Large Language Models. Arxiv 2023

Background

- LLMs show remarkable capabilities in concept understanding, mathematical reasoning, multi-modal applications (e.g., Sora) and tool usage



Prompt: A stylish woman walks down a Tokyo street filled with warm glowing neon and animated city signage. She wears a black leather jacket...

[1] https://openai.com/sora

Background

- The application of LLMs in the networking field is receiving increasing attention

Session 2: Can LLMs reason about networking problems, and their solution?
Session Chair: Ranjita Bhagwan (Google)

Towards Interactive Research Agents for Internet Incident Investigation
Yajie Zhou, Nengneng Yu (Boston University); Zaoxing Liu (University of Marylanc

PROSPER: Extracting Protocol Specifications Using Large Language Models
Prakhar Sharma, Vinod Yegneswaran (SRI International)

Towards Integrating Formal Methods into ML-Based Systems for Networking
Fengchen Gong, Divya Raghunathan, Aarti Gupta, Maria Apostolaki (Princeton Un

Toward Reproducing Network Research Results Using Large Language Models
Qiao Xiang, Yuling Lin, Mingjun Fan, Bang Huang, Siyong Huang, Ridi Wen (Xiam
Kong (Shanghai Jiao Tong University, China); Jiwu Shu (Xiamen University)

Session 6: Can LLMs Manage Networks?
Session Chair: Nate Foster (Cornell)

Adapting Foundation Models for Operator Data Analytics
Manikanta Kotaru (Microsoft)

A Holistic View of AI-driven Network Incident Management
Pouya Hamadanian (Microsoft Research, MIT); Behnaz Arzani, Sadjad Fouladi, Siva Kesava
Rodrigo Fonseca (Azure Systems Research); Denizcan Billor, Ahmad Cheema, Edet Nkposo
(Microsoft Research)

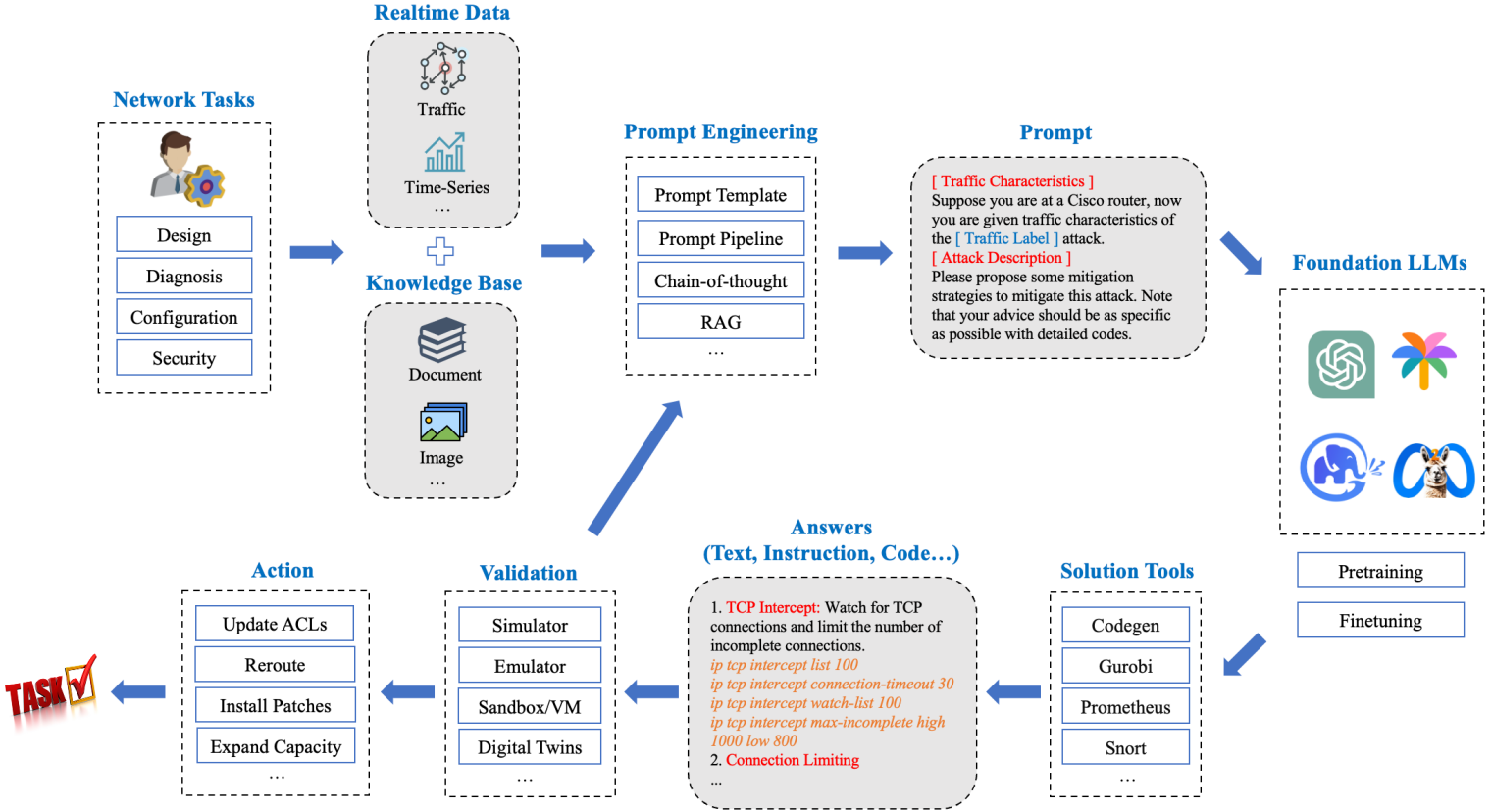
What do LLMs need to Synthesize Correct Router Configurations?
Rajdeep Mondal, Alan Tang (UCLA); Ryan Beckett (Microsoft Research); Todd Millstein, Ge

Enhancing Network Management Using Code Generated by Large Language Models
Sathiya Kumaran Mani (Microsoft); Yajie Zhou (Microsoft and Boston University); Kevin Hs
Segarra (Microsoft and Rice University); Trevor Eberl, Eliran Azulai, Ido Frizler, Ranveer Ch

Related Sessions @ HotNets 2023

[1] https://conferences.sigcomm.org/hotnets/2023/program.html

LLM-in-the-loop Architecture for Networking



LLM-in-the-loop Architecture for Networking

- Challenges
  - Developing methods to **represent heterogeneous network information** in a manner comprehensible to LLMs.
  - Clarifying LLMs' **roles in specific tasks** to prevent hallucinations and ensure desired outcomes.
  - Ensuring the **correctness and safety** of LLM-generated outputs, such as network management commands.
  - Constructing a blueprint for future **LLM-based autonomous network systems**, focusing on reliability and efficiency.

Side Meeting @IETF 119

- Topic: Large Language Model (LLM) for Networking
- Time and Location: 16:00-17:30 (March 20, Wednesday) @ Room P6-7
- Host: Yong Cui (Tsinghua University)
- Agenda (Each talk will last 15 minutes)
  - Opening
  - Talk 1: “LLM for Networking: an overview” by Xiaohui Xie (Tsinghua University)
  - Talk 2: “Using Machine Learning and Word Embedding to Characterise the DDoS landscape with DDoS2Vec” by Marinho Barcellos (University of Waikato)
  - Talk 3: “Thinking and Practice: LLM for Cybersecurity” by Linzhe Li (Zhongguancun Lab)
  - Talk 4: “Usecases of AI for Network” by Xiaoqiu Zhang (China Mobile)
  - Free Discussion