

# Large Language Models (LLMs) for Networking

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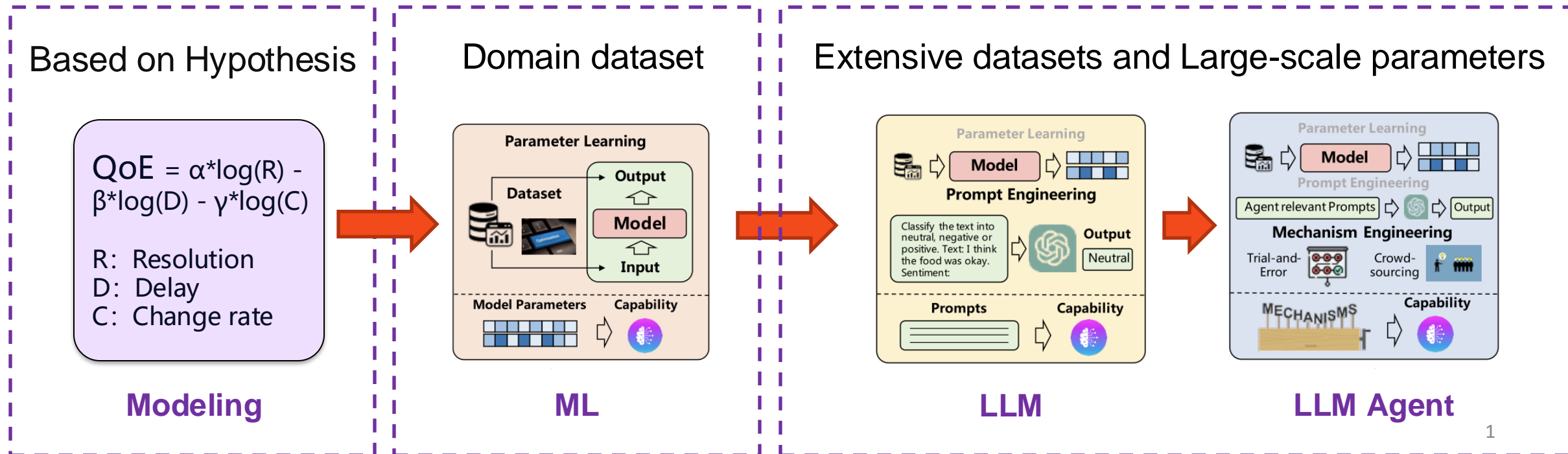
# Background & Motivation

- **Network Challenges:**

- Complex environments
- Diverse demands
- Rapid iteration cycles

- **LLMs' Emerging Capabilities:**

- Concept Understanding
- Logical Reasoning
- Tool Utilization



# Increased Attention on LLMs for Networking

- **HotNets 2023**

- November 2023 @ MIT
- Two sessions (2 out of 9) are dedicated to this topic.

**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 Hamadani (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 H. Segarra (Microsoft and Rice University); Trevor Eberl, Eliran Azulai, Ido Frizler, Ranveer Cl

**HotNets 2023: Twenty-Second ACM Workshop on Hot Topics in Networks**

November 28-29, 2023 — Cambridge, Massachusetts, USA



**Overview**

The Twenty-second ACM Workshop on Hot Topics in Networks (HotNets 2023) will bring together researchers in computer networks and systems to engage in a lively debate on the theory and practice of networking. HotNets provides a venue for discussing innovative ideas and for debating future research agendas in networking.

**Location**

[Samberg Conference Center](#)  
[50 Memorial Dr, Cambridge, MA 02142](#)  
6th floor, Dinning Room 5 & 6  
MIT



**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 Maryland)

**PROSPER: Extracting Protocol Specifications Using Large Language Models**

Prakhar Sharma, Vinod Yegneswaran (SRI International)

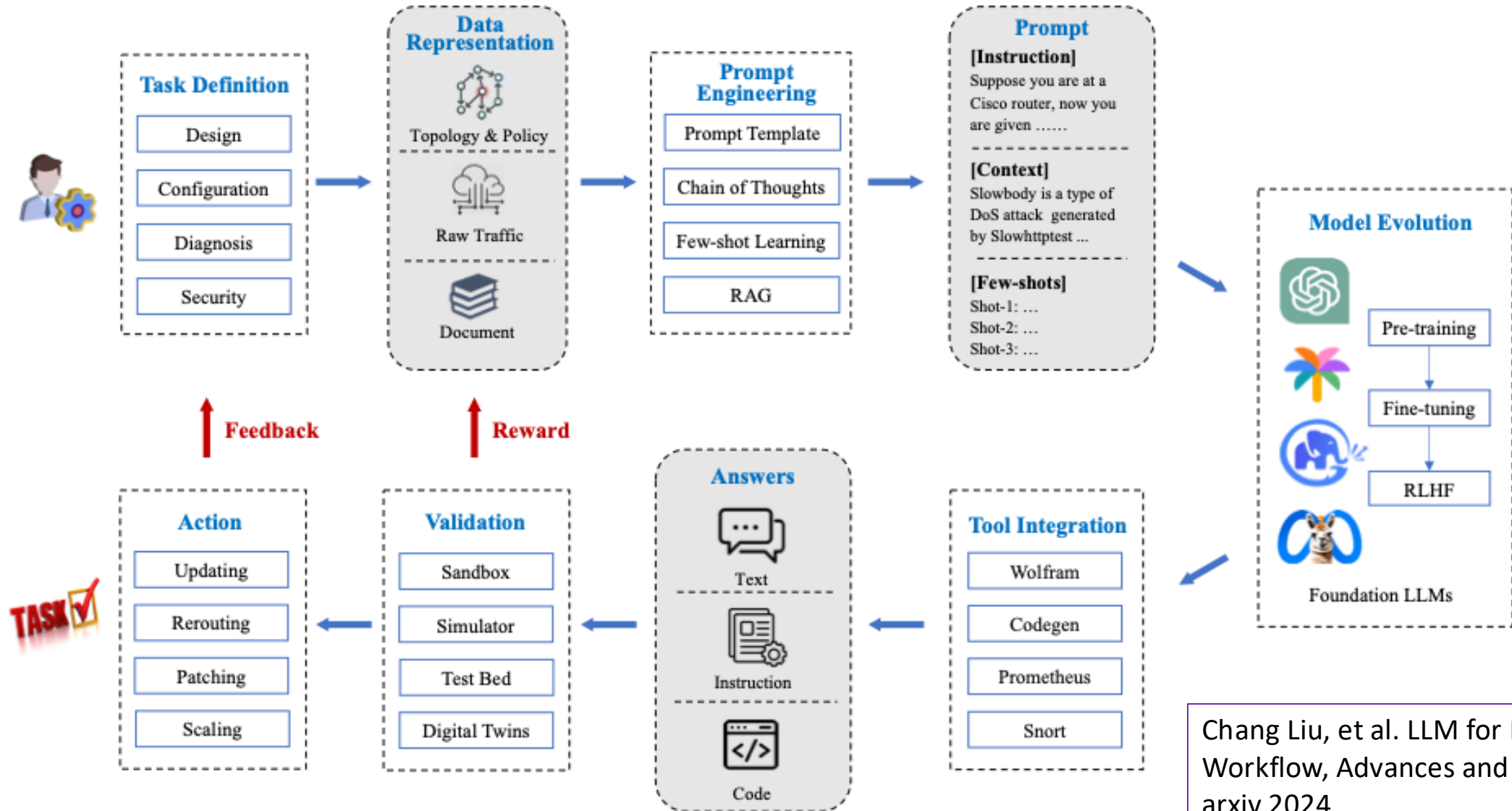
**Towards Integrating Formal Methods into ML-Based Systems for Networking**

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 (Xiamen University); Kong (Shanghai Jiao Tong University, China); Jiwu Shu (Xiamen University)

# Workflow for applying LLMs in Networking



Chang Liu, et al. LLM for Networking: Workflow, Advances and Challenges. arxiv 2024

# Challenges and Future Directions

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- **Understanding Multimodal Data**
  - Multimodal data plays a critical role in the networking domain
- **Prompt Engineering for Deliberate Reasoning**
  - Many networking tasks involve integrating multiple intermediate results to reach a final conclusion
  - multi-path reasoning processes, e.g., Tree of Thoughts or Graph of Thoughts
- **Network-specific LLMs**
  - Construct LLMs specialized for the networking domain to enhance efficiency and performance
- **Validation Environment**
  - Ensuring the reliability and safety of applying LLMs in networking presents a critical challenge

# Thanks

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