Research Papers on 'Paper'

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Paper 1:

Shifting Long-Context LLMs Research from Input to Output

Date: 2025-03-06

Time: 18:59:37

Authors:

Yuhao Wu, Yushi Bai, Zhiqing Hu, Shangqing Tu, Ming Shan Hee, Juanzi Li, Roy Ka-Wei Lee

Summary:

- Recent advancements in long-context Large Language Models (LLMs) have primarily concentrated on processing extended input contexts, resulting in significant strides in long-context comprehension. However, the equally critical aspect of generating long-form outputs has received comparatively less attention. This paper advocates for a paradigm shift in NLP research toward addressing the challenges of long-output generation. Tasks such as novel writing, long-term planning, and complex reasoning require models to understand extensive contexts and produce coherent, contextually rich, and logically consistent extended text. These demands highlight a critical gap in current LLM capabilities. We underscore the importance of this under-explored domain and call for focused efforts to develop foundational LLMs tailored for generating high-quality, long-form outputs, which hold immense potential for real-world applications.

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Paper 2:

An Extended State Space Model of Aggregated Electric Vehicles for Flexibility Estimation and Power Control

Date: 2025-03-06

Time: 18:57:59

Authors:

Yiping Liu, Xiaozhe Wang, Geza Joos

Summary:

- The increasing penetration of electric vehicles (EVs) can provide

substantial electricity to the grid, supporting the grids' stability.
The state space model (SSM) has been proposed as an effective modeling method for power prediction and centralized control of aggregated EVs, offering low communication requirements and computational complexity. However, the SSM may overlook specific scenarios, leading to significant prediction and control inaccuracies. This paper proposes an extended state space model (eSSM) for aggregated EVs and develops associated control strategies. By accounting for the limited flexibility of fully charged and discharged EVs, the eSSM more accurately captures the state transition dynamics of EVs in various states of charge (SOC). Comprehensive simulations show that the eSSM will provide more accurate predictions of the flexibility and power trajectories of aggregated EVs, and more effectively tracks real-time power references compared to the conventional SSM method.

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Paper 3:

Efficiently Escaping Saddle Points under Generalized Smoothness via Self-Bounding Regularity

Date: 2025-03-06

Time: 18:57:34

Authors:

Daniel Yiming Cao, August Y. Chen, Karthik Sridharan, Benjamin Tang

Summary:

- In this paper, we study the problem of non-convex optimization on functions that are not necessarily smooth using first order methods. Smoothness (functions whose gradient and/or Hessian are Lipschitz) is not satisfied by many machine learning problems in both theory and practice, motivating a recent line of work studying the convergence of first order methods to first order stationary points under appropriate generalizations of smoothness. We develop a novel framework to study convergence of first order methods to first and \textit{second} order stationary points under generalized smoothness, under more general smoothness assumptions than the literature. Using our framework, we show appropriate variants of GD and SGD (e.g. with appropriate perturbations) can converge not just to first order but also \textit{second order stationary points} in runtime polylogarithmic in the dimension. To our knowledge, our work contains the first such result, as well as the first 'non-textbook' rate for non-convex optimization under generalized smoothness. We demonstrate that several

canonical non-convex optimization problems fall under our setting and framework.

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Paper 4:

Sample-Optimal Agnostic Boosting with Unlabeled Data

Date: 2025-03-06

Time: 18:54:42

Authors:

Udaya Ghai, Karan Singh

Summary:

- Boosting provides a practical and provably effective framework for constructing accurate learning algorithms from inaccurate rules of thumb. It extends the promise of sample-efficient learning to settings where direct Empirical Risk Minimization (ERM) may not be implementable efficiently. In the realizable setting, boosting is known to offer this computational reprieve without compromising on sample efficiency. However, in the agnostic case, existing boosting algorithms fall short of achieving the optimal sample complexity. This paper highlights an unexpected and previously unexplored avenue of improvement: unlabeled samples. We design a computationally efficient agnostic boosting algorithm that matches the sample complexity of ERM, given polynomially many additional unlabeled samples. In fact, we show that the total number of samples needed, unlabeled and labeled inclusive, is never more than that for the best known agnostic boosting algorithm -- so this result is never worse -- while only a vanishing fraction of these need to be labeled for the algorithm to succeed. This is particularly fortuitous for learning-theoretic applications of agnostic boosting, which often take place in the distribution-specific setting, where unlabeled samples can be availed for free. We detail other applications of this result in reinforcement learning.

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Paper 5:

Sharp multipolar L^p-Hardy-type inequalities on Riemannian manifolds

Date: 2025-03-06

Time: 18:53:39

Authors:

Cristian Ciulic■, Teodor Rugin■
Summary:

- In this paper we prove sharp multipolar Hardy-type inequalities in the Riemannian L^p-setting for $p\geq 2$ using the method of super-solutions and fundamental results from comparison theory on manifolds, thus generalizing previous results for $p=2$. We emphasize that when we restrict to Cartan-Hadamard manifolds, the inequalities improve in the case $2<p<N$ compared to the case $p=2$ since we obtain positive remainder terms which are controlled by curvature estimates. In the end, we treat the cases of positive and negative constant sectional curvature.

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Paper 6:

DEFT: Differentiable Branched Discrete Elastic Rods for Modeling Furcated DLOs in Real-Time

Date: 2025-03-06

Time: 18:50:30

Authors:

Yizhou Chen, Xiaoyue Wu, Yeheng Zong, Anran Li, Yuzhen Chen, Julie Wu, Bohao Zhang, Ram Vasudevan

Summary:

- Autonomous wire harness assembly requires robots to manipulate complex branched cables with high precision and reliability. A key challenge in automating this process is predicting how these flexible and branched structures behave under manipulation. Without accurate predictions, it is difficult for robots to reliably plan or execute assembly operations. While existing research has made progress in modeling single-threaded Deformable Linear Objects (DLOs), extending these approaches to Branched Deformable Linear Objects (BDLOs) presents fundamental challenges. The junction points in BDLOs create complex force interactions and strain propagation patterns that cannot be adequately captured by simply connecting multiple single-DLO models. To address these challenges, this paper presents Differentiable discrete branched Elastic rods for modeling Furcated DLOs in real-Time (DEFT), a novel framework that combines a differentiable physics-based model with a learning framework to: 1) accurately model BDLO dynamics, including dynamic propagation at junction points and grasping in the middle of a BDLO, 2) achieve efficient computation for real-time inference, and 3) enable planning to demonstrate dexterous BDLO manipulation. A comprehensive series of real-world experiments demonstrates DEFT's efficacy in terms of accuracy, computational speed, and generalizability compared to state-of-the-art alternatives. Project page:https://roahmlab.github.io/DEFT/.

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