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Research at WSU

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Jana's webpage says "general research interests are in the broad field of artificial intelligence (AI), where I mainly focus on sub-fields of machine learning, and data-driven science and engineering" (Jana).

I found an article called: *A Survey on Machine Learning: Concept, Algorithms and Applications*. This paper discusses the evolution and concept of Machine Learning (ML), which has grown from a niche interest into a major field used in areas like text analysis, pattern recognition, and data mining. It dives into why machine learning has to be able to use data effectively, accurately, and provide results. Additionally, machine learning is able to process data quickly and avoid human bias, for example, a hiring manager who tends to favor candidates who went to the same college they did, even if other candidates might be more qualified. The paper also notes how machine learnings is used in various industries, such as entertainment, where services like Netflix utilize algorithms to recommend movies based on users' preferences.

On Jana's webpage one of his publications is *Training Robust Deep Models for Time-Series Domain: Novel Algorithms and Theoretical Analysis*. This paper is fascinating because In this paper, I learned about a new method called RObust Training for Time-Series (RO-TS), which helps deep neural networks (DNNs) work better with time-series data. Time-series data is harder to work with than images or text. The authors created a way to improve the model by handling small changes in the data and introduced a new algorithm, SCAGDA, to make it easier to solve the problem.

What I found interesting is that the paper uses the Global Alignment Kernel (GAK) to measure the differences between time-series data instead of the usual Euclidean distance. The authors show through experiments that RO-TS works better and creates stronger models compared to older methods like adversarial training. This makes it a useful approach for real-world time-series problems.

Ananth Kalyanaraman

Ananth's webpage describes his work at the intersection of parallel computing, graph analytics, and bioinformatics/computational biology, with a particular focus on developing algorithms and software for analyzing large-scale data in scientific fields, especially in agriculture, plant, and life science (Ananth).

I found an article called: *A Survey on Deep Learning: Algorithms, Techniques, and Applications* .The article dives into the topic of "deep learning." Deep learning uses multiple layers to build models that can process data in complex ways, and key algorithms like generative adversarial networks and convolutional neural networks have greatly changed how we think about information processing. However, there is still a gap in understanding these methods, as they are often seen as "black boxes" that limit progress in the field.

On Ananth's webpage one of his publications is *Distributed Louvain Algorithm for Graph Community Detection*. I found this paper fascinating because it tackles the problem of detecting communities in large networks, where nodes within the same community are more connected to each other than to other nodes. The paper focuses on the Louvain method, a well-known algorithm used to measure how well a network is divided into communities. Since finding the best partitioning is a difficult problem, the Louvain method is popular because it is fast and gives good results.

In the paper, Ananth presents a way to speed up the Louvain algorithm by using a distributed approach, which allows for parallel processing. I was impressed to learn that their method achieved a 7x speedup on large networks compared to other methods. They also managed to process a much larger graph (the uk-2007 network) in just 32 seconds using 1,000 cores, while other methods couldn’t even run due to memory issues. This shows how Ananth's approach can handle really large networks efficiently.