**新一代神经网络理论与应用研讨会**

**简介**

1. **Irwin King：Social Recommendations: A Historical Perspective and Recent Advancements.**

With the exponential growth of information generated on the internet, social recommendation has become a hot research topic in social computing. Filtered suggestions such as news, music, web pages, and tags are highly desirable to cope with the problem of information explosion. In this keynote, I will present some of our seminal and pioneering work in social and location recommendation based on the matrix factorization framework. I will outline novel ways to use social ensemble, trust relations, tags, click-through rate, etc., to improve social and location recommender systems for a wide range of applications and services. I will also elucidate some recent works that suggest potential future directions in social recommendations.

1. **郭平: Two-Model Synergetic Learning Systems Optimization With Maxwell's Demon Technique.**

A two-model Synergetic Learning Systems (2MSLS) is a special case of the synergetic learning systems. In the 2MSLS, two models (subsystems) are contained: the reduction model and the evolution model, which are governed by neural partial differential equations. The information “particles” diffusion process is described by evolution model; Hence the evolution model is equivalent to the generative model. And the particles condensate process is described by reduction model, which is equivalent to the inference model. In order to optimize 2MSLS, we propose a novel optimization scheme, named Maxwell's demon technique (MDT). The MDT is applied to decrease the system entropy, and it is an integrated technique which includes Bayesian pseudoinverse learners, pseudoinverse learning algorithm for autoencoders, probabilistic principal component analysis. Theoretical analysis shows that our proposed 2MSLS has stronger interpretability with statistical physics image. And the MDT has a great efficiency in optimization compared with Monte Carlo Markov Chain sampling methods. We believe this work is of significance in that it presents a clear view of interpretable deep neural networks with statistical physics perspective, and paves the road to physical artificial intelligence.

1. **李文: 基于假设差异理论的数据与模型泛化性研究**

近年来，以深度学习为代表的数据驱动的机器学习方法在计算机视觉任务中取得令人瞩目的成功。但数据驱动的机器学习方法也存在数据依赖的问题，在训练数据不足或场景覆盖有限情况下表现往往不佳，面临泛化性的挑战。在本报告中，我将基于假设差异（Hypothesis Discrepancy）理论来讨论几个不同的机器学习泛化性问题，包括领域适应、半监督学习和黑盒攻击。具体地，我将从领域差异问题出发，将该理论延展到更一般的泛化性问题中，探讨如何利用假设差异理论来分析和理解这些任务，并设计相应的算法来提升模型在这些任务中的性能。

1. **刘勇: 图神经网络的泛化分析**

近年来，图神经网络受到大家广泛关注，在算法层面得到了长足的进展，然而关于图神经网络的理论分析相对较少，尤其对于其泛化分析基本还处于刚起步的阶段。本报告从转导学习的角度研究图神经网络的泛化性，并详细对比分析了几种常见图神经网络模型的泛化能力，为图神经网络新算法的设计提供了一定的理论指导。

1. **杨海钦: Research on Aspect-level Sentiment Analysis Under Large Language Models.**

细粒度情感分析从不同方面分析人们的观点或情感极性，具有重要的现实意义。本报告通过分享此领域的进展和实验室的科研成果，希望为大家开启大模型时代下自然语言处理领域研究的新课题。