A U S H A N G

FREIE UNIVERSITÄT BERLIN
Fachbereich Mathematik und Informatik

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D I S P U T A T I O N

Dienstag, 13. Februar 2024, 13:00 Uhr

Ort: Seminarraum
(Zuse Institut Berlin, Takustr. 7, 14195 Berlin)

Disputation über die Doktorarbeit von

Kateryna Melnyk

Thema der Dissertation:
Unsupervised approaches for time-evolving graph embedding with application to human microbiome

Thema der Disputation:
On disentangled latent spaces of generative adversarial networks with application to healthcare.

Die Arbeit wurde unter der Betreuung von **PD Dr. T. Conrad** durchgeführt.

Abstract: In recent years, the use of Generative Adversarial Networks (GANs) in healthcare has experienced significant growth [1]. GANs have proven effective in tasks such as image generation, modality conversion, denoising, and image reconstruction [2]. One crucial aspect of GANs in healthcare and other domains is the disentanglement of latent spaces that addresses the challenge of learning representations capable of separating distinct, informative factors of variations in data. These variations range from patient demographics to clinical variables, and learning such representations is vital for privacy preservation, the generation of diverse, representative, and realistic data. Moreover, disentanglement in generative models can also be used to further ensure fairness in learned representations [3]. Disentanglement methods in GANs can be categorized into two types: unsupervised and supervised with models like InfoGAN and β-VAE being state-of-the-art. While a lot of research focuses on unsupervised methods, it has been proven that unsupervised disentanglement learning without inductive biases is theoretically impossible and they do not allow to consistently learn disentangled representations [4].Supervised methods in turn require annotated features which are usually difficult to obtain due to privacy concerns.In this talk, I will discuss the fundamental concepts of GANs with the main focus being on the disentanglement of GANs along with its state-of-the-art methods. Finally, I will explore how well-disentangled latent spaces of GANs can help in generating fair and controllable synthetic data in healthcare.

[1] Kuzlu, M., Xiao, Z., Sarp, S., Catak, F. O., Gurler, N., & Guler, O.
(2023, June). The Rise of Generative Artificial Intelligence in Healthcare. In 2023 12th Mediterranean Conference on Embedded Computing (MECO) (pp. 1-4). IEEE.
[2] Koshino, K., Werner, R. A., Pomper, M. G., Bundschuh, R. A., Toriumi, F., Higuchi, T., & Rowe, S. P. (2021). Narrative review of generative adversarial networks in medical and molecular imaging. Annals of Translational Medicine, 9(9).
[3] Chen, R. J., Wang, J. J., Williamson, D. F., Chen, T. Y., Lipkova, J., Lu, M. Y., & Mahmood, F. (2023). Algorithmic fairness in artificial intelligence for medicine and healthcare. Nature biomedical engineering, 7(6), 719-742.
[4] Nie, W., Karras, T., Garg, A., Debhath, S., Patney, A., Patel, A. B., & Anandkumar, A. (2019). Disentangled GANs for controllable generation of high-resolution images.

Die Disputation besteht aus dem o. g. Vortrag, danach der Vorstellung der Dissertation einschließlich jeweils anschließenden Aussprachen.

Interessierte werden hiermit herzlich eingeladen

Der Vorsitzende der Promotionskommission
PD Dr. T. Conrad