



香港中文大學
The Chinese University of Hong Kong



JAGIELLONIAN UNIVERSITY
IN KRAKÓW

Chinese University of Hong Kong – Jagiellonian University Joint Research Seminar

Jagiellonian University, Faculty of Chemistry

Krakow, 24 October 2025





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Seminar Program

09:30-09:45 Welcome and Opening Remarks

09.45-11.15 Chinese University of Hong Kong Session

09.45-10.15 Prof. Hoi Ying WONG (Department of Statistics and Data Science, CUHK): *Machine Learning and Data-Driven Decisions with Applications in Finance*

10.15-10.45 Prof. To NGAI (Department of Chemistry, CUHK): *Pickering Emulsions as Templates for Engineering High-Performance Hollow Spheres*

10.45-11.15 Prof. Michael PITTMAN (School of Life Sciences, CUHK): *New Insights into the Origin of Flight in Theropod Dinosaurs*

11.15-11.30 *CUHK offer for students* (PhD programs and scholarship opportunities to undergraduate and postgraduate students)

11.30-12.00 Coffee break

12.00-13.30 Jagiellonian University Session

12.00-12.30 Prof. Igor Podolak (Faculty of Mathematics and Computer Science, JU): *Machine Learning at the Jagiellonian University Research Group GMUM*

12.30-13.00 Prof. Szczepan Zapotoczny (Faculty of Chemistry, JU): *Macromolecular Engineering of Surface-Grafted Polymer Brushes and Nanocapsules*

13.00-13.30 Dr. Katarzyna Magiera-Mularz (Faculty of Chemistry, JU): *Targeting proteins: structural biology at the frontier of cancer immunotherapy*

Location: Jagiellonian University, Faculty of Chemistry, Gronostajowa 2, room: A1-01





Machine Learning and Data-Driven Decisions with Applications in Finance

Hoi Ying WONG^a

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In this talk, we introduce some machine learning applications in finance. With high-frequency data such as limit-order book (LOB), we explain the use of deep learning in identifying potential trading signals. High-frequency trading can then be constructed subject to the risk management. We also introduce an innovative continuous-time reinforcement learning (RL) framework, aimed at optimizing utility functions. Using classic dual solutions (model-based mathematical results) as a guide for learning utility optimization, and our proposed RL module is applicable to a broad spectrum of utility functions with flexible regularization. Specifically, our goal is to learn the relaxed control that makes the terminal value of the state process close to that of the dual solution. Our framework then solves the problem of classic RL, in which the training process is terminated once the exploration violates the no-bankruptcy constraint due to randomization. Using continuous entropy regularization, the optimal policy is shown to follow a Gaussian distribution with time-decaying variance. We establish the consistency that the RL exploratory policy converges to the classic feedback control when the temperature parameter reaches zero. Our framework uses the classic solution as a guide along with the RL algorithm and offers a tractable and partially data-driven approach to utility optimization that can be easily extended to other applications.



Professor Hoi Ying WONG
Associate Dean (Student Affairs)
Department of Statistics and Data Science

Prof. Wong obtained his B.Sc. degree with first class honours in Mathematical Sciences from the Hong Kong Baptist University in 1997 and Ph.D. in Mathematics from the Hong Kong University of Science and Technology in 2001. He joined CUHK in same year and was a founding Co-Director of the Quantitative Finance and Risk Management programme and Director of the MSc in Risk Management Science programme. He received the Vice-Chancellor's Exemplary Teaching Award twice in 2015 and 2020 as a recognition of his outstanding contribution in teaching.

Pickering Emulsions as Templates for Engineering High-Performance Hollow Spheres

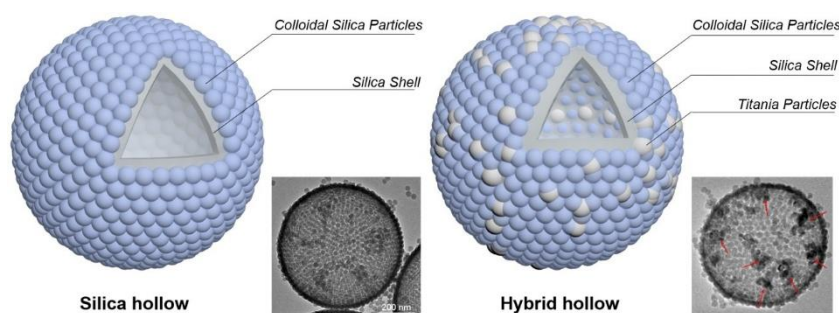
To NGAI^a

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A hollow sphere is a type of powder featuring an interior hollow structure, with sizes ranging from nanometers to micrometers. Due to their unique characteristics, such as high optical contrast and low density, these spheres are extensively used in industrial coatings that require white opacity and brightness. However, conventional methods for producing hollow particles with specific properties—such as size, permeability, mechanical strength, and biocompatibility—remain challenging. Therefore, the development of new manufacturing techniques for hollow particles is increasingly important. In this presentation, I will demonstrate the use of Pickering emulsions as templates for creating hollow spheres, which opens up exciting opportunities for applications in UV-blocking and functional materials. By leveraging the structural and

functional versatility of colloidal systems, we can design innovative materials that meet the demands of various industries, from personal care to anti-sedimentation water-based white inks and advanced coatings.



References

¹ L.D. Liu, and T. Ngai, *Langmuir*, **2022**, 38, 13322-13329.

² H. Jiang, Y. F. Sheng, and T. Ngai, *Curr. Opin. Colloid Interface Sci.* **2020**, 49, 1-15.



Professor To NGAI Assistant Dean (Research) Department of Chemistry

Prof. Ngai obtained his B.Sc. degree with first class honours and Ph.D. in Chemistry from CUHK in 1999 and 2003 respectively. He then pursued his postdoctoral training in Germany and USA before joining CUHK as a Research Assistant Professor in 2006. Prof. Ngai received the Croucher Fellowship in 2003 and many other teaching and research awards like Faculty Exemplary Teaching Award, Research Excellence Award, Young Researcher Award thereafter. His research interests center on various areas of surface and colloid science.



New Insights into the Origin of Flight in Theropod Dinosaurs

Michael PITTMAN^a

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This talk provides a case study of integrated multidisciplinary science relating to a key transition in the history of life. Capability for powered flight has been confirmed for ancient fossil birds, but found to be rare in their closest feathered dinosaur relatives, with many falling just short. This paints a picture of extensive experimentation in wing use for ground locomotion before flight evolved, whilst detailed study of powered flying theropods points to complex origins of these abilities. In this talk, I will present highlights of our pioneering contributions to this emerging story involving thousands of fossils from all continents and a range of study methods and approaches from aerodynamic modelling to laser imaging and developmental biology. This talk concludes with the new work we are working on and our priority areas for future research.



Professor Michael PITTMAN **Assistant Professor, School of Life Sciences**

Prof. Pittman obtained his B.Sc., M.Sc. and Ph.D. in Geology and Palaeobiology from UCL in 2003, 2007 and 2012 respectively. He then joined the University of Hong Kong as a Research Assistant Professor in 2013. In 2022, he joined CUHK as an Assistant Professor. Prof. Pittman's teaching has garnered international recognition, and his research has featured on the covers of journals including PNAS. His research is focussed on evolutionary biology, particularly the evolution of dinosaurs and animal flight, but also includes the development of new techniques and archaeological and polar science. He is the 2024 recipient of the Science Faculty Young Researcher Award.

Machine Learning at the Jagiellonian University Research Group GMUM

Igor Podolak^a

^a Faculty of Mathematics and Computer Science, Jagiellonian University,
Krakow, Poland.

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This presentation will provide an overview of the research being pursued at GMUM, the Group of Machine Learning Research at the Faculty of Mathematics and Computer Science, Jagiellonian University. The group's research interests span a wide range of machine learning topics, with particular emphasis on theoretical foundations and the development of novel machine learning models. Key research areas include optimization methods, generative models, large language models, and image processing. The group also addresses advanced challenges in neural network interpretability and explainability, investigating how deep learning models represent and organize knowledge internally. GMUM maintains a strong focus on practical applications, particularly in drug design and computational chemistry. The group collaborates with leading research institutions including the Faculty of Chemistry at Jagiellonian University, and industrial partners such as Molecule. One on retro-synthesis research and personalized drug design. These interdisciplinary collaborations bridge fundamental machine learning research with real-world pharmaceutical applications. The group actively contributes to the academic community through numerous research grants and supervises a substantial cohort of doctoral students. GMUM members regularly publish in top-tier venues including NeurIPS, ICLR, ICML, ICPR, ICCV, and AAAI, as well as top journals. At the Faculty of Mathematics and Computer Science, GMUM operates the bachelor's degree program in Artificial Intelligence, training the next generation of machine learning researchers and practitioners.

Professor Igor Podolak **Machine Learning Research Group, Faculty of Chemistry**



Igor T. Podolak is a professor of Computer Science specializing in advanced machine learning, particularly deep learning. His research focuses on knowledge representation in generative systems and developing novel interpolation methods in latent spaces. He also studies how deep neural networks - especially Transformers and Large Language Models - organize internal knowledge, with applications in drug design. Professor Podolak earned his Computer Science degree from Jagiellonian University and has authored over 50 papers in top venues such as NeurIPS, ICLR, ICML, AAAI, and Scientific Reports. His research involves international collaborations, including partnerships with institutions in South Korea. He has supervised four PhD students and leads the Machine Learning Research Group (GMUM) at Jagiellonian University, one of Poland's leading AI research centers.

Macromolecular Engineering of Surface-Grafted Polymer Brushes and Nanocapsules

Szczepan Zapotoczny^a

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The research activities of the group focus on the design, synthesis, and modification of polymers to achieve advanced macromolecular architectures with tailored functionalities. A particular emphasis is placed on the controlled preparation of surface-grafted polymer brushes and polymer-based nanostructures such as nanocapsules and nanoparticles. The group develops innovative materials and coatings based on conductive, photoactive, and stimuli-responsive polymer brushes, as well as two-dimensional (2D) polymeric structures designed for applications in photovoltaics, nanoelectronics, and chemical or biological sensing. In addition, the group explores the chemical modification of natural polymers to enhance their biocompatibility and functionality for biomedical applications, particularly in the fabrication of drug-delivery and theranostic systems. Special attention is given to the development of core-shell nanocapsules with oil-based cores capable of encapsulating and releasing lipophilic active compounds. These nanocapsules also serve as nanophotoreactors for light-driven chemical transformations. The comprehensive approach combining polymer chemistry, surface engineering, and nanotechnology enables the creation of multifunctional materials with tunable physicochemical and responsive properties, addressing challenges in energy conversion, catalysis, and targeted therapy.

Professor Szczepan Zapotoczny **Head of Nanotechnology of Polymers and Biomaterials** **Group, Faculty of Chemistry**



Prof. Zapotoczny completed his PhD in chemistry in 1999 at Jagiellonian University, focusing on polymeric photosensitizers. He was a postdoctoral researcher with Prof. G. J. Vancso at the University of Twente (1999–2001), studying force spectroscopy and self-assembled systems. He leads numerous national and international R&D projects with partners from Germany, China, Sweden, and Austria. Author of over 180 papers and 20 patents (six commercialized), he has received major national awards for scientific and inventive achievements. He serves on the Scientific Councils of three institutes and the Committee of Chemistry of the Polish Academy of Sciences. He is also an evaluator for Polish and international research funding agencies.

Targeting proteins: structural biology at the frontier of cancer immunotherapy

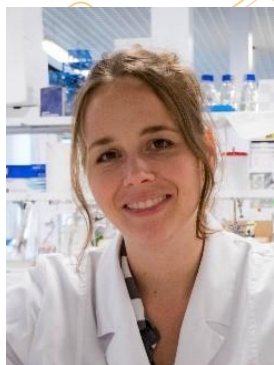
Katarzyna Magiera-Mularz^a, Justyna Kocik-Król^a, Bogdan Musielak^a, Łukasz Skalniak^a

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Our research group focuses on the development and structural characterization of inhibitors targeting the PD-1/PD-L1 immune checkpoint axis. We are pioneers in structural studies of PD-L1 complexes with small molecules and macrocyclic peptides, providing insight into the molecular determinants of protein–protein interactions. Our work combines X-ray crystallography, NMR spectroscopy, and cellular assays to evaluate inhibitor binding, functional activity, and preliminary preclinical potential, including *in vitro* and *in vivo* studies.

We report the characterization of pAC65, a macrocyclic peptide inhibitor of PD-L1 with potency comparable to that of the clinically approved antibody atezolizumab. pAC65 effectively disrupts PD-1/PD-L1 and PD-L1/CD80 interactions, activates T lymphocytes, and demonstrates high binding affinity without detectable toxicity. Studies also revealed species-specific differences in PD-L1, highlighting the importance of careful selection of preclinical models and providing a framework for evaluating PD-L1 inhibitors.



Dr Katarzyna Magiera-Mularz
Member of Bioorganic and Medicinal Chemistry Group,
Faculty of Chemistry

Katarzyna Magiera-Mularz completed her PhD at Jagiellonian University in 2016, beginning research on the three-dimensional structures and modulation of protein–protein interactions. Her work focuses on key oncological targets, including PD-1/PD-L1 immune checkpoint receptors and CDK4/6 kinases, aiming to develop and characterize inhibitors with therapeutic potential. She is the author of several highly cited publications that have contributed to the field of cancer immunotherapy. Dr. Magiera-Mularz has received major awards for young researchers, and two national grants funded by NCN. She also has gained extensive international experience through X-ray structural studies at leading European synchrotron facilities, including the SLS, PSI (Switzerland), HZB (Germany), and ESRF (France).