Justin Ho Tin Chan, Ph.D.

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Education

2020 – 2024 **Ph.D., University of Huddersfield** Optics and Metrology.
Thesis title: *Ultra-Compact Metrology systems using Nanophotonic Elements* (Currently in write-up period)
Project Goal: To utilise optical metasurfaces for the development of ultra-compact sensors and systems for metrology applications, realising real-time feedback-driven autonomous manufacturing processes envisioned by Industry 4.0.
I decided to take on the PhD position as I am fascinated with metasurfaces and enjoy the intellectual challenge of research and creating something new. The project has been a success and resulted in 2 papers published and an oral presentation at BICOP 2023.

2015 – 2020 **M.Eng., B.Eng., University of Leeds (2:1)** in Mechanical Engineering with industrial placement (Between Year 3&4).
I have also volunteered at STEM Ambassador during term times. The projects I have come across and taken on from within the degree and outside, have both given me a broad set of skills which I think would be useful to give me a bigger picture view of how systems are integrated.

Employment History

2018 – 2019 **Assistant Development Scientist** Malvern Panalytical.
During the placement year, I was working under the supervision of David Bryce, a senior development scientist within the Research and Development team at Malvern Panalytical, specifically on the Zetasizer product. I was carrying out the task of optics modelling with the use of Zemax software, and integration of the model within the CAD model of the product to better inform the tolerance during the alignment process, achieving the goal of Digital Twin.

2018 **Research Intern** University of Alberta.
A summer research project revolved around the research in Experimental methods in Dental Biomechanics. Conducting laboratory work in tensile stress of ceramic materials used in dental applications (e.g. crowns) and analysis of the corresponding fatigue issues. Solidworks FEA simulation was used to assist in this study.

Projects

Aerial Robotics Manipulation 2020 A final year team project working on the development of a solution to bridge bearing inspection via the use of delivery of ground inspection robot with multicopter with an attached robotics arm. I was responsible for the mechanical design of the manipulator and ensuring systems meet the requirement and integrate well with each other, also programmed the electronics of the manipulator and the corresponding delivery sequence.

Projects (continued)

Space exploration robotics 2018	Investigating space exploration robotics, and various locomotion methods, while also implementing the mbed c++ programming of the robotic behaviours using Subsumption Architecture to enable robust locomotion to respond to the environment. The sensors used involved an infrared distance sensor, LDR, IMU and whiskers.
MedTechBest 2018	Part of a team of 5 members, each from a different background, including mechanical engineering, medical engineering and PhDs. We have developed an innovative idea for medical devices to solve creatinine issues in hospitals and allow faster diagnostics and survivability of patients due to early detection.
Autodesk Robotics Design 2017	Design of a robot that operates in a household environment. This requires taking concepts from daily life usage and aims to ease life. The award was a runner-up award out of the 30 finalists out of 200+ contestants.
EMBECOSM ChipHack 2017	Participated in a 2.5 days event, got exposure to FPGA and came across Verilog programming and learned the basics from other more experienced participants, stepping out of my comfort zone as a mechanical engineering student as the area was a huge leap for me.
LabVIEW Hackathon2017	LabVIEW Hackathon at the University of Leeds, I learned more about MyDAQ and light tracking and was inspired to solve this problem creatively. This experience has cultivated a lot of teamwork skills while allowing me to take on individual parts which then get integrated into the bigger project itself.
Formula Student 2017	Participated in Formula Student project throughout the term time, learned about automobile engineering, created CAD of wishbone structure as per specifications and learned to collaborate with a team of other engineering students.

Transferable Skills Highlights

Languages	English, Cantonese, Mandarin
Coding	Matlab, Arduino/ Mbed(C/C++), Python
Software	Zemax optics modelling, Lumerical FDTD simulation, Solidworks CAD, FEA, LabView
Misc.	Academic research, optics and electromagnetism, FDTD-driven metasurface simulation and design, laser, optics lab and experimental skills

Transferable Skills Highlights (continued)

Self-motivated and Creativity	Raised a discussion with my supervisor during placement and attempted an optical cloaking optics setup, taking on personal Arduino and Raspberry Pi projects from time to time, currently delving into computer architecture, C, Verilog, FPGA and neuromorphic computing
Initiative and Adaptability	Volunteered to assist my colleague with further lab work involving learning and using C# and SDK(s), spatial light modulator, during my current thesis write-up period and is ongoing
Team work and Problem Solving	Learned to collaborate with different disciplines and present analysis in an effective and simplified way, from presentations during my placement year, to projects during my undergrad degree and current PhD project. I have also collaborated with my PhD colleague Daniel on tip-tilt metasurface, and contributed relevant insights towards the design
Communication and Presentation	Communicated effectively with my supervisor Andrew on upcoming tasks and the direction of the project, explaining my approach in corresponding experiments and simulations, while also presenting my project clearly to other audiences at various conferences and presentations, including other PhD students of different disciplines.
Documentation	I have also conducted detailed documentation of my work during my placement year in the form of both short videos and powerpoint slides, illustrating the use of the Zemax software and how it aided the optics modelling of the instrument, as well as the overall workflow, as a means to transfer knowledge to the next placement year student that was carrying on with where my work left off as I progressed towards the end of the placement year
Time Management	Learnt to utilise agile, sprint planning and assign tasks in the framework of MoSCoW and better time estimation for each task at hand during my placement year. I have also developed better abilities in planning and prioritising tasks

Volunteering

STEM Ambassadors

2017–2019

- **STEM Code Club**, Teaching children and guiding them through simple projects using Scratch 2, raising their interest in coding.
- **Science Fair**, Taking part in the outreach day along with other placement students at Malvern Panalytical, bringing the fascination of light and other instrumentation to visitors and children, cultivating interest in science as well as pursuit of STEM careers in people of different ages, especially children.

Miscellaneous Experience

Certifications

2021 **Understanding and Evaluating Mesurement Uncertainty**. Awarded by National Physics Laboratory.

Introduction to measurement and metrology. Awarded by National Physics Laboratory.

Introduction to measurement uncertainty. Awarded by National Physics Laboratory.

2018 **CSWA - Solidworks**. Awarded by Dassault Systèmes.

2014 **IELTS**. Awarded by British Council.

Hobbies and Interests

3D printing, bouldering, piano, cycling

Research Publications

Journal Articles

1. P. Falak, J. H.-T. Chan, J. Williamson, *et al.*, "An ultra-compact metasurface and specklemeter based chromatic confocal sensor," *IEEE Transactions on Instrumentation and Measurement*, 2024.
2. J. Chan, D. Tang, J. Williamson, H. Martin, A. Henning, and X. Jiang, "An ultra-compact metasurface-based chromatic confocal sensor," *CIRP Annals*, vol. 72, no. 1, pp. 465–468, 2023.

Conference Proceedings

1. J. H.-T. Chan, H. Martin, A. J. Henning, and X. Jiang, "Metasurfaces as an enabling technology to realise ultra-compact sensors for manufacturing applications," in *Metamaterials XIV*, K. F. MacDonald, I. Staude, and A. V. Zayats, Eds., International Society for Optics and Photonics, vol. PC12990, SPIE, 2024, PC129901O. DOI: 10.1117/12.3017142.
2. D. J. Townend, A. J. Henning, J. H. T. Chan, *et al.*, "Developing on-machine, In-process sensors enabled by multifunctional metasurface elements," in *Optics and Photonics for Advanced Dimensional Metrology III*, P. J. de Groot, F. Guzman, and P. Picart, Eds., International Society for Optics and Photonics, vol. 12997, SPIE, 2024, p. 1 299 703. DOI: 10.1117/12.3016748.
3. P. Falak, J. H.-T. Chan, J. Williamson, *et al.*, "Chromatic confocal metalens and scattering medium-based speckle pattern engineering for compact, low-cost distometers," in *Optical Fiber Sensors*, Optica Publishing Group, 2023, Tu3–80.
4. D. J. Townend, J. H.-T. Chan, J. Williamson, *et al.*, "Ultra-compact sensors realized via metasurfaces," in *British and Irish Conference on Optics and Photonics 2023*, Optica Publishing Group, 2023, W3B.5. DOI: 10.1364/BICOP.2023.W3B.5.

References

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