# 2024/25 B.Sc CS FYP areas

## Prof. Johann Briffa

Areas of interest are as follows:

- GPU computing / high-performance computing
- Image & signal processing
- Error control coding

Current (and recently completed) projects include:

- Quantum communications - particularly quantum key distribution [PRISM / QSNP / QUDICE / (QUANGO)]
- Light field capture and processing [(Volare)]
- Satellite image analysis [ADVISER / RBMP]
- Drone missions for acquisition of large-scale 3D assets

Possible titles: (to be discussed with me first - RSA contract can be set up)

- Embedded implementation of QKD post-processing stack
- Simulator / component for QKD end-to-end link
- Front-end / back-end implementation for WebGIS platform
- Automated processing pipeline for satellite image analysis
- Mobile application for DJI drone automated flight control
- Blender plugins for drone flight path planning
- High precision camera distortion correction

## Prof. Ing. Victor Buttigieg

Areas of interest are as follows:

- Smart Homes
- Software Defined Radio
- Error Control Coding

## Prof. Ing. Carl James Debono

Areas of interest are as follows:

- Object detection and tracking
- Medical image / video processing
- Depth-based video processing

## Dr Ing. Trevor Spiteri

Areas of interest are as follows:

Digital signal processing

- Digital signals include audio, video, etc.
- Processing them involves analysing, filtering, etc.
- Requirements:
  - Mathematical background
  - Some programming (C, Python, or other, depending on the project)

Embedded systems

- Have tight constraints, such as small memory, microcontrollers, etc.
- Can also be used for Internet of Things (IoT) devices

## Prof. Ing. Saviour Zammit

Areas of interest are as follows:

- 5G/Beyond 5G/6G Open Platforms for Communications
- Low-latency, robust, multimedia (especially video) communications
- UAV/IoT communications
- AI/ML for communication systems

Current Projects:

- Digital Twins for NTN 5G/6G Communications
- AI/ML applications for Communications
- Video capture and inference from UAVs
- V2X communications in 5G/B5G/6G

## Prof. Christian Colombo

Areas of interest are as follows:

- Runtime verification (e.g. robotics, financial systems)
- Communication protocol security
- Machine learning for cyber security

Sample Project Titles:

- Runtime verification of robotic systems running on ROS2
- Securing the X3DH Protocol through RV-TEE
- Machine learning techniques for malware detection

## Prof. Joshua Ellul

Areas of interest are as follows:
- Blockchain
- Cryptocurrencies
- Smart Contracts
- Virtual Machines

## Prof. Adrian Francalanza

Areas of interest are as follows:
- Concurrency and Distribution
- Programming Language Design and Implementation
- Static and Runtime Verification

## Prof. Mark Micallef

Areas of interest are as follows:
- Software Engineering
- Test Automation

Sample Project Titles:
- Automated Test Case Generation using Machine Learning Techniques
- Identifying knowledge risks in software engineering through automated analysis of human interactions

## Prof. Gordon Pace

Areas of interest are as follows:
- Software verification
- Domain specific language design and implementation
- Formal reasoning about contracts
- Runtime verification

## Dr Sandro Spina & Dr Keith Bugeja

Areas of interest are as follows:

Offline and Real-time Rendering

- Parallel and distributed rendering algorithms for physically-based visualisation
- Psychometric modelling for rendering optimisations
- Immersive virtual reality environment creation and visualisation (including material modelling and rendering, PCG and HCI)
- Denoising and upscaling of rendering output for scenes with glossy and specular surfaces
- Accelerated hybrid rendering (rasterisation-ray tracing) pipelines

Serious Games / Video Games

- Asset, world and environment procedural generation (e.g. clothing, city-scapes, levels)
- Creation of emerging behaviour in gameplay elements, e.g.:
    - solving problems in ways the developer did not envisage
    - interaction of systems to create credible but interesting/surprising outcomes

## Dr Mark Vella

Areas of interest are as follows:

- Actionable Cyber Threat Intelligence for Security Information and Event (SIEM) using Artificial Intelligence

Sample Project Titles:

- Actionable Cyber Threat Intelligence to filter False Positives in SIEMs.
- Automatic extraction of IoCs' from threat reports.
- Generating behaviour detection rules from system logs.
- Alert aggregation based on actionable CTI.
- Extracting attack patterns from CTI.

Keywords: Cyber Threat Intelligence (CTI), Indicators of Compromise (IoC), STIX/TAXII, SIEM, Intrusion detection systems (IDS), Applied Machine Learning (ML), AutoEncoders (AE), Convolution Neural Networks (CNN), Large Language Models (LLM).