

JOINT PRESS RELEASE

5 January 2017
[FOR IMMEDIATE REPORTING]

NATIONAL RESEARCH FOUNDATION SINGAPORE AND ISRAEL'S TEL AVIV UNIVERSITY AWARD FOUR CYBERSECURITY RESEARCH PROJECTS

The National Research Foundation (NRF), Prime Minister's Office, Singapore and Israel's Tel Aviv University (TAU) have awarded four cybersecurity research projects under the NRF-TAU collaboration programme in areas including improving cybersecurity through human behaviour modelling, and deterring cybersecurity threats through Internet topology.

2. The NRF-TAU collaboration programme was launched in May 2016 by the NRF's National Cybersecurity R&D Programme and TAU's Blavatnik Interdisciplinary Cyber Research Center (ICRC). It aims to support collaborative research projects in the areas of enhancing cybersecurity for Smart Nation and Internet of Things; behavioural study and social science of cybersecurity; and policy and governance of cybersecurity.

3. Four projects were awarded based on the relevance and significance of their research areas to create impact in Singapore. The four projects in collaboration with TAU are listed. See **Annex** for details.

- i. Improving cybersecurity through optimal policy design and human behaviour modelling led by Nanyang Technological University (NTU);
- ii. Deterring cybersecurity threats through Internet topology, law enforcement and technical mitigation led by Singapore Management University (SMU);
- iii. Safety and privacy of smart city mobile applications through model inference led by SMU; and
- iv. Quantification of cyber risk led by NTU.

4. On the NRF's collaboration with TAU, Mr George Loh, Director (Programmes) of NRF and Co-Chair of the National Cybersecurity R&D Programme Committee, said, "Cybersecurity is a global threat which extends beyond national boundaries. Israel has strong cybersecurity capabilities and has developed technologies for 10 per cent of the world market. Singapore's collaboration with the Blavatnik Interdisciplinary Cyber Research Center at Tel Aviv University will enable high quality cross-disciplinary and collaborative research in areas such as cybersecurity for smart cities and cybersecurity policies and governance, which complements the research at our local universities. These projects will also strengthen the design of our Smart Nation interfaces, for example to automatically provide user-centric security policies on mobile devices based on a user's profile such as their mobile usage or age."

5. Professor Isaac Ben Israel, Head of TAU's ICRC, said, "The cyber phenomenon in recent years affects our lives in many aspects more than the information layer itself. The academic world is therefore imperative in this day and age in providing the innovation and breakthroughs for this revolution. The academic cooperation between the NRF and TAU provides a unique synergy of two national perspectives on cybersecurity. NRF and TAU work together to exchange best practices, support collaborative research and grow humanity's global understanding of cybersecurity challenges."

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For media enquiries, please contact:

For National Research Foundation, Prime Minister's Office, Singapore

Ms Hoh Suk Mun
Senior Officer, Corporate Communications
National Research Foundation, Prime Minister's Office, Singapore
Tel: +65 6694 5036; HP: +65 9150 2036
Email: hoh_suk_mun@nrf.gov.sg

For Tel Aviv University

Ms Revital Yaron
Conference and Events Manager
Blavatnik Interdisciplinary Cyber Research Center, Tel Aviv University
Tel: +972-36406041; HP: +972-544333381
Email: reviy@post.tau.ac.il

About the National Research Foundation, Prime Minister's Office, Singapore

The National Research Foundation (NRF) is a department within the Prime Minister's Office. The NRF sets the national direction for research, innovation and enterprise (RIE) in Singapore. It seeks to invest in science, technology and engineering, build up the technological capacity of our companies, encourage innovation by industry to exploit new opportunities that drive economic growth, and facilitate public-private partnerships to address national challenges.

Under RIE2020, NRF is committed to create greater value in Singapore from our investment in research, innovation and enterprise through 1) closer integration of research thrusts, 2) stronger dynamic towards the best teams and ideas, 3) sharper focus on value creation, and 4) better optimised RIE manpower. Visit www.nrf.gov.sg/RIE2020 for more details.

About the Tel Aviv University

Tel Aviv University (TAU) - Israel's largest and most comprehensive institution of higher learning - is home to over 30,000 students studying in nine faculties and over 125 schools and departments across the spectrum of sciences, humanities and the arts.

Situated in Israel's cultural, financial and technological capital, TAU shares Tel Aviv's unshakable spirit of openness and innovation – and boasts a campus life as dynamic and pluralistic as the metropolis itself. Tel Aviv the city and Tel Aviv the university are one and the same – a thriving Mediterranean center of diversity and discovery.

Consistently ranked in the top 20 in the world in terms of scientific citations and among the top 100 universities internationally, Tel Aviv University is also Israel's first choice for students, and its graduates are the most sought after by Israeli companies. Global in outlook and impact, TAU advances teaching and research that break down the walls between disciplines, striving to address the twenty-first century's most pressing challenges through bold, interdisciplinary solutions.

About the Blavatnik Interdisciplinary Cyber Research Center

The Blavatnik Interdisciplinary Cyber Research Center (ICRC) was established at the Tel Aviv University as a joint initiative with the National Cyber Bureau, Prime Minister's Office.

The Center brings together researchers from Tel-Aviv University and emphasises the importance of interdisciplinary research. Currently, there are 50 faculty members and over 200 cyber researchers from different faculties such as Exact Sciences, Computer Sciences, Law, Engineering, Social Sciences, Management and Humanities.

The Center aims to become a leading international body in its field and to increase the academic efforts and awareness in the field of cybersecurity.

Research topics at the Center include key issues such as security software, attacks on hardware and software, cryptography, network protocols, security of operating systems, and networks as well as interdisciplinary research such as the impact on national security, the impact on society, regulation, and the effects on the business sector.

Details of the Awarded Projects under the NRF-TAU Collaboration Programme

1.	<p>Project Title: Improving cybersecurity through optimal policy design and human behaviour modelling</p> <p>This project aims to design efficient policies for the government to reduce cyber attacks through analysing the interactions between different parties involved in the cyber ecosystem. This includes:</p> <ul style="list-style-type: none"> • Government, who builds the fundamental infrastructures and issues policies and laws to regulate the cyber activities; • Service providers, who provide various cyber services, such as online banking, online security insurance, cloud computing, etc.; • Users, who are the majority of the participants in the ecosystem; and • Cyber attackers who seek to cause damages to both service providers and users, for their own benefit. <p><u>Principal Investigators:</u></p> <ul style="list-style-type: none"> • Lead Principal Investigator: Assistant Professor Bo An, School of Computer Science and Engineering, Nanyang Technological University • Co-Principal Investigator: Assistant Professor Liu Yang, School of Computer Science and Engineering, Nanyang Technological University <p><u>Collaborator from Tel Aviv University:</u></p> <ul style="list-style-type: none"> • Professor Joachim Meyer, Department of Industrial Engineering
2.	<p>Project Title: Deterring cybersecurity threats through Internet topology, law enforcement and technical mitigation</p> <p>This project addresses the two key questions of how we can characterise the interdependency of cyber attacks and how we can achieve a balance between openness and security, when implementing international enforcement and technology information sharing to counter cyber attacks.</p> <p>The research team will model how cyber attacks across regions are interdependent by linking it back to the underlying Internet topology. They will also quantify the relative effectiveness of domestic law versus international law in deterring cyber attacks, and evaluate how the extent of information shared by cybersecurity emergency response agencies alleviates cybersecurity threats.</p> <p><u>Principal Investigators:</u></p> <ul style="list-style-type: none"> • Lead Principal Investigator: Assistant Professor Wang Qihong, School of Information Systems, Singapore Management University • Co-Principal Investigator: Assistant Professor Tang Qian, School of Information Systems, Singapore Management University • Co-Principal Investigator: Professor Robert Deng, School of Information Systems, Singapore Management University <p><u>Collaborators from Tel Aviv University:</u></p> <ul style="list-style-type: none"> • Professor Yuval Shavitt, School of Electrical Engineering • Mr Lior Tabansky, Department of Political Science

3.	<p>Project Title: Safety and privacy of smart city mobile applications through model inference</p> <p>This project aims to protect the safety and privacy of people who use mobile applications to access smart city services.</p> <p>The project will design a system that detects anomalous and potentially harmful behaviours in apps and create suitable alerts. By creating a model that captures the characteristics of an app's normal behaviour, it can help to detect violations during runtime, summarise the risk in an informative manner, and give users the opportunity to disallow or approve it.</p> <p>There will also be user interaction models for different users, such as power users, senior citizens and children.</p> <p><u>Principal Investigators:</u></p> <ul style="list-style-type: none"> • Lead Principal Investigator: Associate Professor David Lo, School of Information Systems, Singapore Management University • Co-Principal Investigator: Associate Professor Gao Debin, School of Information Systems, Singapore Management University <p><u>Collaborators from Tel Aviv University:</u></p> <ul style="list-style-type: none"> • Dr Shahar Maoz, School of Computer Science • Dr Eran Toch, Department of Industrial Engineering • Dr Eran Tromer, School of Computer Science
4.	<p>Project Title: Quantification of cyber risk</p> <p>This project will facilitate new areas of research in cyber risk, security and insurance at Nanyang Technological University and will also recommend policies to the Singapore government on advanced cyber risk protection and prevention. It will combine the technological, strategic and behavioural aspects of cybersecurity together to form an academic framework.</p> <p><u>Principal Investigator:</u></p> <ul style="list-style-type: none"> • Lead Principal Investigator: Professor Shaun Wang, Division of Banking & Finance, Nanyang Business School, Nanyang Technological University <p><u>Collaborators from Tel Aviv University:</u></p> <ul style="list-style-type: none"> • Professor Asher Tishler, Coller School of Management • Dr Ohad Barzilay, Coller School of Management • Mr Amitai Gilad, Coller School of Management