

IARU Global Internship Program @ NUS 2014

About IARU

The International Alliance of Research Universities (IARU), established in late 2005, is an alliance of ten of the world's leading research universities – The Australian National University, ETH Zurich, National University of Singapore, Peking University, University of California, Berkeley, University of Cambridge, University of Copenhagen, University of Oxford, The University of Tokyo and Yale University. It is a strategic drawing together of universities that share a similar vision and have a commitment to educating future leaders. For more information on IARU please visit: www.iaruni.org.

IARU Global Internship Program @ NUS 2014

NUS is pleased to offer eleven summer internships in 2014 for students from IARU partner institutions. Please refer to the descriptions below:

Internship no 1:

Host Faculty/ Department	Department of Biological Sciences Faculty of Science
Internship Title	Documentation and quantification of butterfly wing patterns (DBS1)
Duration of Internship	19 May – 11 July 2014
Supervisor / Mentor	Prof. Antonia Monteiro
Internship Description	<p>The internship will involve dissecting and photographing butterfly wings (under a microscope) and using image analysis software to quantify size of particular wing patterns. The work will contribute to an ongoing study that aims to identify species that show sensitivity to rearing temperature (plasticity) and how rearing temperature alters their wings patterns.</p> <p>Skills required:</p> <ul style="list-style-type: none"> • Careful worker • Attention to detail • Interested in biodiversity

Internship no 2:

Host Faculty/ Department	Department of Biological Sciences Faculty of Science
Internship Title	The impact of Pleistocene climate change on South-east Asian bird diversification (DBS2)
Duration of Internship	19 May – 11 July 2014
Supervisor/ Mentor	Dr. Frank Rheindt

Internship Description	<p>South-east Asia is known to be a hotspot of biodiversity, yet the mechanisms of organismic diversification of South-east Asian biota remain little studied. This project investigates the diversification mechanisms of a number of South-east Asian bird species through detailed population-genetic and phylogenetic comparison across the region. By comparing island populations separated by different sea depths, we examine the effect of recent Pleistocene ice ages and subsequent shifts in global sea level on avian diversification.</p> <p>The successful internship applicant will come with a passion for biodiversity and biological processes, and with a willingness to learn contemporary laboratory techniques to apply to evolutionary research. He or she may also opt to take part in field activities, such as DNA sampling of birds in local patches of rainforest.</p>
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Internship no 3:

Host Faculty/ Department	Department of Biological Sciences Faculty of Science
Internship Title	A bioeconomic modelling of 'oil palm pests' infestation in Southeast Asia. (DBS3)
Duration of Internship	19 May – 11 July 2014
Supervisor/ Mentor	Dr. Tarek Soliman & Dr. Roman Carrasco
Internship Description	<p>Oil palm is one of the key plantations in Southeast Asia due to its significant contribution to economic growth, employment generation, and poverty alleviation in the region. Pest and disease infestation, such as bracket fungus (<i>Ganoderma</i>), rhinoceros beetle (<i>Oryctes rhinoceros</i>), and Red palm weevil (<i>Rhynchophorus ferrugineus</i>), are one of the main causes of yield losses of oil palm plantations. So far, the introduction, spread and economic impacts of invasive palm oil pests in the region is very poorly documented. The scarcity of research on palm oil pests in Southeast Asia prevents knowing the magnitude of the problem and hence deters evidence-based management policies to be coordinated and adopted.</p> <p>The objective of the study is twofold: the first objective is problem oriented; to assess the expected economic consequences of an oil palm pest infestation in Southeast Asia using an integrated spread-economic model. The second objective is methodological; to determine the effect of market structure specification (perfect competition, oligopoly and monopoly) on the assessment results. A stratified diffusion model combining both short and long distance dispersal processes is used to predict the infested area over time, while partial budgeting and a perfect competition/oligopolistic model is used to estimate the subsequent economic impacts at the producer and market level. Assessing the scale of the problem</p>

	<p>is very important to inform the decision makers on the economic justified spending on pest management.</p> <p>Skills required:</p> <ul style="list-style-type: none"> • Competency in programming in R or GAMS, familiarity with pest spread or partial equilibrium modeling is desirable • Ability to plan and write manuscripts.
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Internship no 4:

Host Faculty/ Department	Department of Computer Science, School of Computing
Internship Title	Using an equation to speed up cache simulations (DCS1)
Duration of Internship	19 May – 11 July 2014
Supervisor / Mentor	Prof. Tay Yong Chiang
Internship Description	<p>There is current interest in using nonvolatile memory (PCM, STTRAM, etc.) for processor caches, thus reducing their cost and energy consumption. However, such memories have limited endurance, so they require new designs.</p> <p>The standard way to evaluate a cache design (replacement policy, fault tolerance, etc.) is via simulation. However, nonvolatile processor caches will be large (e.g. hundreds of sets), so simulating them will be very compute-intensive.</p> <p>There is a Page Fault Equation (http://www.youtube.com/watch?v=bFcSiw8oWOs&feature=gv) that has been successfully applied to model misses for the page cache in RAM, record buffer in database systems, etc.</p> <p>The purpose of this project is to examine how this equation can be used to speed up simulation of nonvolatile processor caches.</p>

Internship no 5:

Host Faculty/ Department	Department of Computer Science, School of Computing
Internship Title	Concurrency control for social network data (DSC2)
Duration of Internship	19 May – 11 July 2014
Supervisor / Mentor	Prof. Tay Yong Chiang
Internship Description	<p>Online social networks can have a huge amount of data, and they need to manage that data. Social network services are usually started by small teams of developers and typically use some free, off-the-shelf database system -- e.g. MySQL -- to manage the data. There is widespread sentiment that</p>

	<p>relational database management systems, like MySQL, are not scalable, in the sense that their concurrency control imposes a consistency criterion -- serializability -- that is too stringent.</p> <p>This project is motivated by an ambition to replace MySQL with sonSQL ("son" for "social networks", see http://sonsql.comp.nus.edu.sg/) as the default database system for social network data. sonSQL is a variant of MySQL, but with a database schema, called sonSchema, that has a restricted form.</p> <p>The aim of this project is to examine how this restricted form can be exploited to provide serializability, but without the scalability bottleneck.</p> <p>Skills required:</p> <ul style="list-style-type: none"> • Mathematical aptitude • Familiarity with database management system
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Internship no 6:

Host Faculty/ Department	Department of Computer Science, School of Computing
Internship Title	Equation-based flash allocation to virtual machines (DSC3)
Duration of Internship	19 May – 11 July 2014
Supervisor / Mentor	Prof. Tay Yong Chiang
Internship Description	<p>Data centers are moving towards using flash as an intermediate memory layer between RAM and disks. In this setting, it is common for workloads to run in individual virtual machines (VMs). To provide performance isolation and guarantee quality of service, the flash should be appropriately partitioned among the VMs.</p> <p>There is a Page Fault Equation (http://www.youtube.com/watch?v=bFcSiw8oWOs&feature=gv) that has been successfully applied to model misses for the page cache in RAM, record buffer in database systems, etc.</p> <p>The purpose of this project is to examine how this equation can be used for partitioning to achieve various objectives.</p> <p>Skills required:</p> <ul style="list-style-type: none"> • Mathematical aptitude

Internship no 7:

Host Faculty/ Department	Department of Computer Science, School of Computing
Internship Title	On modeling 2-dimensional and 2-level caches (DSC4)
Duration of Internship	19 May – 11 July 2014

Supervisor / Mentor	Prof. Tay Yong Chiang
Internship Description	<p>Memory is a primary resource that is required in computing. It is organized in a hierarchy, with one level often acting as a cache for lower levels. When a cache does not hold a referenced data item, there is a cache miss and the reference is forwarded to memory in a lower level. Typically, cache misses increase when cache size is decreased.</p> <p>Access latencies for different levels of the memory hierarchy can differ by orders of magnitude. This implies a cache miss can be very expensive in terms of execution performance. For this reason, there is long-standing interest in understanding how cache misses depend on cache size.</p> <p>There is a Page Fault Equation (http://www.youtube.com/watch?v=bFcSiw8oWOs&feature=gv) that has been successfully applied to model misses for the page cache in RAM, record buffer in database systems, etc.</p> <p>The purpose of this project is to extend this equation to (a) set-associative processor caches and (b) caches that span two levels of the memory hierarchy.</p> <p>Skills required:</p> <ul style="list-style-type: none"> • Mathematical aptitude

Internship no 8:

Host Faculty/ Department	Department of Computer Science, School of Computing
Internship Title	Query optimization for social network data (DSC5)
Duration of Internship	19 May – 11 July 2014
Supervisor / Mentor	Prof. Tay Yong Chiang
Internship Description	<p>Online social networks can have a huge amount of data, and they need to (a) manage that data and (b) analyze them. Social network services are usually started by small teams of developers and typically use some free, off-the-shelf database system -- e.g. MySQL -- to manage the data.</p> <p>This project is motivated by an ambition to replace MySQL with sonSQL ("son" for "social networks", see http://sonsql.comp.nus.edu.sg/) as the default database management system for social network data. sonSQL is a variant of MySQL, but with a database schema, called sonSchema, that has a restricted form.</p> <p>The aim of this project is to examine how this restricted form can be exploited to improve classical optimization for relational database queries, in the context of social network data.</p>

	Skills required: <ul style="list-style-type: none"> • Mathematical aptitude • Familiarity with database management system
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Internship no 9:

Host Faculty/ Department	Department of Electrical & Computer Engineering, Faculty of Engineering
Internship Title	Wireless Sensor and Actuator Node Realization (ECE1)
Duration of Internship	19 May – 11 July 2014
Supervisor / Mentor	Prof. SK Panda and Dr. Hoang Duc Chinh
Internship Description	<p>Saving energy and satisfying human comfort in building are two main objectives of a building management system but often conflicted. It is required to monitor indoor environment, process the collected data and make proper decision on controlling the equipment of the buildings to achieve these objectives with the support of wireless sensor and actuator networks. A friendly Graphic User Interface, efficient data transfer mechanisms and control algorithms need to be developed for such systems to enable smart building environments. Hardware design of the actuators is also part of the project.</p> <p>Working on this project, the student has opportunity to work with different wireless sensor and actuator network platforms. He/she will also gain experience on implementation of real applications in building automation systems.</p> <p>Skills Required: Thus, it is required for the student to have strong background on electrical and computer engineering. Fundamental understanding of communication systems is an advantage. The student should be familiar with programming languages like C and Java as well as PCB design.</p>

Internship no 10:

Host Faculty/ Department	NUS Museum
Internship Title	Lee Kong Chian Collection Curatorial Research Intern (NM1)
Duration of Internship	19 May – 11 July 2014
Supervisor / Mentor	Ms Chang Yueh Siang
Internship Description	This internship will give interns a broad overview into the curatorial research process from object research and selection to exhibitions or publications planning. The intern will be required to assist in research, compiling and updating of object lists and bibliographies for forthcoming exhibitions and publications projects. Projects include the publication of the

	<p>Lee Kong Chian Collection catalogue, and object research and listing for forthcoming gallery exhibits rotation.</p> <p>Skills Required:</p> <ul style="list-style-type: none"> • Strong interest in research, in a particular, research of an bibliographical nature • Demonstrable knowledge (or interest) in Chinese and Chinese Art History • Excellent English and Mandarin written and oral communications • Dependable and responsible • Able to work independently and collaboratively
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Internship no 11:

Host Faculty/ Department	NUS Museum
Internship Title	T.K. Sabapathy Collection Curatorial Research Intern (NM2)
Duration of Internship	19 May – 11 July 2014
Supervisor / Mentor	Mr Kenneth Tay
Internship Description	<p>At present, the Prep Room at the NUS Museum hosts a collection of books and artworks donated by Singaporean art historian T.K. Sabapathy. This collection, ranging from artworks by Southeast Asian artists to books about Indian mythology and cultural criticism, will form a public resource library where research into the modern and contemporary art of Southeast Asia may be facilitated, with the longer view of eventually conceiving an exhibition that deals with these materials and their various potentials for furthering thoughts on the region.</p> <p>This position will require the intern to:</p> <ul style="list-style-type: none"> • Work extensively with the collection of T.K. Sabapathy • Develop ways in which these materials can be extrapolated as fragments of not just an evolving literature on Southeast Asian modern and contemporary art, but on the question of “Southeast Asia” as well • Research and propose potential developments for an exhibition that may engage potentially with the year 2015 (and the 50th anniversary of Singapore) • Engage with the potentials and implications of curating as an alternative or parallel form of (re)writing art history <p>Required Skills:</p> <ul style="list-style-type: none"> • An interest in looking at museums and curating as sites of critical discourse (any previous knowledge or research in museum studies, art history or curatorial studies is recommended, but not a requirement) • A strong interest for Southeast Asia not only as a

	highly-heterogeneous and problematic entity but also as a critical site from which to recast much of today's global vernacular
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