

The Ring

THE JOURNAL OF THE CAMBRIDGE COMPUTER LAB RING

Issue XL — September 2015

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Who's Who

Stephen Allott (T MA80) has been appointed Chairman of pebble {code}.

Louise Auger (CAI MA98) is working at The Home Office where she is a user researcher.

Shaw Chuang (K PhD00) is now CTO Cloud Computing at Huawei Technologies in the San Francisco Bay Area.

Peter Conn (TH MA14) has recently joined Google as a software engineer.

Stephen Davidson (G BA98, MSci99) is VP Technology at MagicTab.

Ajit Dhalwal (DOW Dip07) is a software Developer at Zone.

Chris Galley (CHR MA87) is head of IT at PayDashboard.

Tony Gould (F BA91) is a consultant at Morgan Stanley.

Jagdeep Grewal (CTH BA93) is Director of Business Systems (interim) at Guy's and St Thomas' NHS Foundation Trust.

Richard Hadden (Q Dip97) is a Partner at Reply SpA group and Investment Director at Breed Reply, an internet-of-things early stage investor and incubator.

Roger Hill (JN BA85) is a consultant at Moneycorp Ltd in London.

Alex Howard (EM BA03) is Strategy and Optimisation Manager at Origami Energy.

Tom Jacques (CHR Dip99) is VP Consultant at Greenwich Associates, the

leading provider of global market intelligence and advisory services to the financial services industry.

Daniel Kumar (MAst14) is a Watson Cognitive Software Engineer at IBM in North Carolina.

Henry Jong-Hyeon Lee (PhD00) is VP and head of Mobile Security Technologies at Samsung Mobile.

Haikal Pribadi (CL MPhil14) is CTO at Ontoit Holdings Ltd.

Having completed the gruelling Escape from Alcatraz Triathlon, **Sunil Shah** (F MA09) has signed up for a half Ironman in Santa Cruz in September.



Sunil Shah on the second leg of the Alcatraz Triathlon

In March 2016, the Absa Cape Epic in the Western Cape in South Africa awaits. Local

and international mountain bikers (amateur and professional) will tackle the demanding eight-day adventure through roughly 800km of unspoilt scenery and 15000m of accumulated climbing.

Muhammad Shahbaz (RA12) is a software engineering intern at Barefoot Networks in Palo Alto.

Eirini Spyropoulou (W MPhil07) is a Research Associate in Data Science at the University of Bristol.

Paul Theobald (CHU MA90) has joined the Systems Architecture team at Metaswitch Networks.

Andy Twigg (JN PhD06) has been appointed Chief Scientist at InsideSales.com in the San Francisco Bay Area.

Andrew Wallace (EM BA84) has been appointed CEO of Pyreos Ltd.

Assel Zhiyenbayeva (F BA10) is now Deputy Head, Information Technology Department at the National Bank of Kazakhstan.

The Ring, Issue XL September 2015

Web: <http://www.cl.cam.ac.uk/ring/>

E-mail: cam-ring@cl.cam.ac.uk

Tel: +44 1223 763585

Post: William Gates Building, Cambridge CB3 0FD

Published three times a year. Copy deadline for the January 2016 issue is December 5th 2015. All content is copyright ©The Cambridge Computer Lab Ring 2015 unless otherwise noted.

The Ring is the journal of the Computer Lab Ring, which is the graduate association of the University of Cambridge Computer Laboratory.

Matt Clifford



Matt Clifford co-founded Entrepreneur First with Alice Bentinck in 2011. EF has now helped graduates build technology companies worth over \$15million.

TR: When we think of a tech accelerator programme we normally think about start-ups being given the cash-infused nudge they need to realise the full potential of their ideas. Entrepreneur First (EF) looks at things differently: you grab the best talent before they've worked out the start-up they're going to create, so focusing on people rather than ideas. Why have you taken this approach?

MC: We believe that starting a start-up should be the number one career choice for the most talented and ambitious people. We know that there are many people in the UK (perhaps especially Cambridge computer scientists) who would be exceptional start-up founders, but who get sucked into corporate jobs early in their careers and never leave. This means that the UK misses out on amazing technology companies that never get built — and that those individuals miss out on amazing entrepreneurial careers that never get started.

What we've done over the last three years at EF is demonstrate that exceptional individuals can achieve extraordinary results, even if they start pre-team and pre-idea.

EF exists to make it possible for those people to choose to start a start-up early in their careers. Before EF, it was impossible to get funding unless you already had a team, an idea and a plan — and, of course, if you didn't have those, you'd arguably be foolish to turn down a secure, well-paid job to try to develop them. What we've done over the last three years at EF is demonstrate that exceptional individuals can achieve extraordinary results, even if they start pre-team and pre-idea. The people who've joined EF since 2012 have now built deep technology companies worth over \$15million.

This makes us confident that supporting and funding people who would otherwise not start start-ups is an even larger opportunity than supporting and funding start-ups that already exist.

TR: If you accept individuals based on talent, pre-team and pre-ideas, how do you help them build exciting new companies?

MC: EF provides comprehensive support, all the way from deciding that you want to start a start-up through to raising your first round of investment. The three most important elements of this are team building and idea generation; growth; and funding.

Team building and idea generation: We think we've probably built more start-ups from scratch than almost anyone else. The starting point is the quality of the participants. We select a cohort of extremely talented, likeminded people with deep technical backgrounds who are determined to start a company. We combine this with a culture that encourages people to build hard things together and experiment. Some people already know exactly what they want to build from the start; others are looking to get involved in other people's ideas. We provide funding for three months to allow people time to explore different teams and ideas. By the end of that period, typically 75% of people have a team and idea that they're excited about.

Our team includes hugely successful entrepreneurs and investors who have built technology companies worth over \$1 billion between them, so collectively we have a lot of knowledge about how to help a start-up grow.

Growth: The key is hands-on mentorship and advice from a highly experienced team. At EF, we've now built 50 companies across multiple sectors and technologies. We've seen every mistake it's possible to make — and, fortunately, a lot of success too. Our team includes hugely successful entrepreneurs and investors who have built technology companies worth over \$1 billion between them, so collectively we have a lot of knowledge about how to help a start-up grow.

Funding: We've helped our start-ups raise over \$40million (as well as raising around \$15million ourselves), so we know what investors are looking for and how to impress them. We've built deep relationships with most of the active early stage investors in the UK and many in the rest of the world, so we can make the right introductions at the right times. Some of the best investors in the world, such as Index Ventures, Balderton Capital and Y Combinator, have backed EF companies.

TR: How many applications do you receive per year and how many graduates do you take? What percentage is from Cambridge?

MC: We run a programme every six months (September and March start dates) and we'd expect to receive about a thousand applicants for each. We plan to fund around 100 people in each programme. We're proud to get a lot of applicants from Cambridge: just over 16% of those joining in September 2015 are Cambridge grads. It's easily our biggest source of great people.

TR: How many start-ups have been spawned by EF since you started? Can you tell me about some of the successes?

MC: We've built just over 50 companies over the last three years. We think we have a pretty exciting track record. Some examples include Adbrain (a leading adtech start-up that uses artificial intelligence to help brands build cross-device campaigns); Mavrx (a computer vision/drones company that provide analytics for agriculture); Permutive (an machine learning-powered intelligent ad server for sponsored content); Magic Pony Technology (a start-up that uses computer vision to deliver next generation video compression); and Tractable (a start-up that uses deep learning to automate industrial inspection tasks). These five alone have raised over \$20million dollars from some of the best investors in the world.

TR: EF receives no government or charitable funding. What's your funding model?

MC: EF makes money from investing in the companies we help to build. We like this business model, because it means our incentives are entirely aligned with the people who join us: we only succeed if they succeed. We raised our fund from private investors who believe that the EF model will produce world-class start-ups and so deliver excellent returns. They include some of Europe's top entrepreneurs, including some of the founders of companies like Zoopla, LoveFilm and Metaswitch.

TR: You also co-founded Code First: Girls to address the lack of technical female graduates applying to EF. What percentage of your annual cohort is female? How do you think universities can attract more women into computer science and engineering?

MC: Women are massively underrepresented in technology — both as entrepreneurs and as engineers. It's a huge challenge for the industry as a whole. It's a particularly big challenge at EF, where only around 10% of our participants are women. Our applicant pool is also roughly 10% female, as are many university computer science courses, so while we need to do much better ourselves, we also know that the challenge is deep rooted. There are no easy answers, but we believe that two important things are to introduce computer science as early as possible (starting to teach computational thinking in schools is a good start) and to highlight the amazing successes of female founders. In a way, one of the challenges is that too often the only media discussion of "women in tech" is to highlight the underrepresentation. That's understandable, but we should also be celebrating some of the phenomenal role models out there — EF alumni Vivian Chan (founder of Sparrho) and Emily Brooke (founder of Blaze) are great examples.

TR: What are your future plans? How are you going to grow the programme?

MC: We want EF to be the place where the world's most talented technologists build the world's most important technology companies. We've made a good start, but there's a long way to go. We're scaling up rapidly: in our first year, 30 people took part in the programme; next year over 200 will. We're also expanding our horizons beyond the UK. The Government of Singapore is one of our investors and we're currently exploring whether running an EF programme there makes sense. We can imagine EF evolving in lots of different ways in the years ahead, but it will always be rooted in two core values: working with exceptional people and building exceptional technology.

EF recently announced that it has raised an £8.5million fund, investment that will enable it to scale up its programme, including backing and mentoring 200+ people per year. Investors include Encore Capital, Singapore's Infocomm Investments, and various angel investors including Robin Klein (ex-Index Ventures) and Alex Chesterman (CEO of Zoopla).

You can find out more about EF at www.joinef.com

SwiftKey



SwiftKey's technology features on more than 250 million devices. Co-founder Ben Medlock shares the secrets of success.

TR: Ben, when we last spoke in 2010 the company had only been going for two years and was called TouchType! Since then you have enjoyed a sharp upward trajectory: you reached 1 million users in 2011, 10 million in 2012, 100 million in 2013 and now SwiftKey's technology features on more than 250 million devices. You've raised total investment of over US\$21 million, received numerous awards including a prestigious Webby Award for Innovation, been named Wired's No 1 hottest start-up and been listed in the Sunday Times 100 Best Small Companies to Work For.

Can you share the secrets of your success?

BM: SwiftKey's mission is to enhance interaction between people and technology, and we try and stay focused on that. Everything we do is about providing the best experience for our users. We set high standards for ourselves and are dedicated to fostering a company culture that encourages continually learning, improving and working together. It's also about iterating quickly, failing fast and improving — which is one of the reasons we've recently set up SwiftKey Greenhouse, a creative place where we can try out new ideas and experimental products. We're committed to making sure our ideas are given the space to grow.

Going free has definitely accelerated our growth, for instance in our first month we saw a 54% increase in our global user base.

TR: Last year SwiftKey took the bold step of moving from a paid to an in-app purchase model so that revenue is now generated via paid themes within the app. Can you tell me more about this?

BM: The average uptake of free apps over paid is huge, as much as 100x. We made this decision as a means of getting our products out to many more people, removing payment as a barrier. Going free has definitely accelerated our growth, for instance in our first month we saw a 54% increase in our global user base. We were aware that a price

tag can be a barrier to growth, especially in developing markets, and it's been great to see increased adoption in places like India and Brazil since we took that decision. We also have several revenue sources, including partnerships with leading mobile manufacturers around the world, plus users can choose to pay for content to enhance their keyboard beyond personalised word and phrase predictions.

TR: How has SwiftKey addressed the challenge of integrating multiple languages in one keyboard?

BM: Multilingual support has been a priority for us from the start. We have users all over the world, and many of them speak two or more languages. Having to manually switch out languages on your keyboard is tedious and inconvenient, so it's a priority of ours to make it easy and intuitive to write in multiple languages on SwiftKey. On Android or iPhone, you simply enable the languages you use (three at a time on Android and two at a time on iOS), start typing in any of the languages and the keyboard will automatically detect what you're typing in and adjust your word predictions accordingly. It will also learn how you personally use languages together — for example, if you often type a greeting in one language but switch to another language for the rest of your message, SwiftKey will remember this and start predicting in your style.

We're pretty sure that the "keyboard of the future" looks quite different from today's evolved typewriters

TR: Now you also have offices in San Francisco and Seoul. Is London still SwiftKey's engineering base?

BM: Yes, the majority of our engineers are based in our London office. London is increasingly becoming a hub for recruiting great talent from

all over the world and we're really proud of the team we've assembled, not only in our London headquarters but also in San Francisco, Seoul, Delhi and Shenzhen.

TR: Can you tell me about SwiftKey's InnovationWeek?

BM: Innovation has always been one of SwiftKey's core values, but it takes time and effort to make it more than a slogan. Since the early days of the company, we've devoted the equivalent of one day a month to Innovation Days, which are opportunities for the entire company to think and work differently. Recently, we decided to try devoting an entire week to cultivate collaboration between SwiftKey-ers who don't typically work together and see what happens when we have an extended period of time to think and experiment outside the usual patterns. It worked really well! More than worth the investment in terms of idea generation and positive effect on company morale. You can read about some of the ideas we explored on our blog.

TR: What about your future product plans?

BM: We're working on a lot of different projects right now, though I can't go into specifics. The primary aim of our keyboards is to help people get their thoughts into their devices fast and with minimal effort, and we're thinking about what that looks like in a future where deep AI drives a much more personal and adaptive device experience. We're pretty sure that the "keyboard of the future" looks quite different from today's evolved typewriters, and we're working out how to get from here to there!

To catch up with all SwiftKey's news go to the blog at: <http://swiftkey.com/en/category/blog/>

SwiftKey Greenhouse can be found at: <http://swiftkey.com/en/greenhouse/>

Captain Buzz: An All-Smartphone Autonomous Delta-Wing Drone

Oliver Chick earns his drone wings

There are more smartphones being manufactured each day than babies being born. Whilst one hopes that these babies will live into their eighties, seldom will a smartphone be used for more than eighteen months. Despite the considerable environmental advantages of recycling phones, fewer than 10% will be recycled.

18 months ago, I was in a 'Happy Hour' (Friday night PhD get-together) discussion with colleagues Daniel Wagner, Ramsey Faragher and James Snee about this trend and we decided to embark on a project to find new uses for previous-generation smartphones sat at the back of drawers. This was the start of 'Captain Buzz'. Captain Buzz is (as far as we know) the world's first drone flown entirely by a smartphone. By installing the Captain Buzz app on an old smartphone, putting it into a drone and connecting the phone to the flight surfaces, no other electronics onboard the drone are needed.

A modern smartphone has all you need to build an autopilot: the GPS, whilst designed for helping you navigate cities, can locate the drone's position; the gyroscopes, designed for racing games, can detect the yaw, roll and pitch of the drone; and the magnetometer can find its compass heading. Combined with the considerable processing power on a smartphone, these data can be combined to provide an autopilot without external sensors. A more challenging issue is how a smartphone can control the flight surfaces of a drone. Whilst hobbyist projects typically use microprocessors, such as the Arduino, to control outputs, we were intent on an all smartphone solution. We therefore use the headphone socket to control our flight surfaces. By synthesising pulse-width modulation messages via an audio waveform and connecting the headphone socket to the servos of the plane, we can do away with other electronics. As the headphone socket allows two waveforms, for left and right audio feeds, we can control the output of two servos. For this reason, our current airframe is a delta-wing drone, which only needs two flight surfaces.

Whilst I said that we have an all-smartphone drone we currently have to cheat slightly. Commercial off-the-shelf servos require 5 volts to operate, but the headphone jack only output 1 volt. We therefore

boost the voltage with an op-amp, effectively increasing the volume to make Captain Buzz 'shout' his commands more loudly. We have found a supplier of 1 volt servos on Alibaba, which would eliminate the need for the op-amp, however there is a minimum order of 10 000 units...



Oliver Chick (l) and Ramsey Faragher with Captain Buzz (copyright Ian Davies; photoshopped by Mistral Contrastin)

Having found a way for Buzz to control the flight surfaces we needed an airframe. Whilst we could have bought a delta-wing plane off-the-shelf, we instead decided it would be much more fun to build one on the lab laser cutter. Timothy Goh went about adopting an open-source design of a delta-wing for our purposes, and assembling it with copious amounts of hot glue and sticky tape.

With a beautiful airframe and our app we performed flight tests around West Cambridge. Initially these flights were disappointing, especially when we connected left and right the wrong way round, causing the drone to rapidly “land” soon after takeoff. Even when correctly wired-up, Captain Buzz flew like a pregnant duck. This sluggishness was caused by the total lag of measuring sensors, calculating the relevant control theory and then outputting a correctly-generated audio signal. Initially this lag was around 250ms, however after a weekend of optimisation I reduced this to around 90ms. Now Captain Buzz flies like a fighter pilot, and he is a much better pilot than any of his ground crew!

We have great ambitions for Captain Buzz: with the sensors available on a smartphone, it should be possible to create the world's most advanced drone, with cutting-edge capabilities.

Since building Captain Buzz we have found some advantages of building drones from smartphones rather than conventional electronics. The networking and sensory capabilities rival those in almost any other device. What's more, the phone manufacturers do the hard work of making them interoperate behind the Android API. This means that in very little code we can add neat features. For instance, we now have support for Android wear that lets us use a smartwatch to make Captain Buzz perform aerobatics.

We have great ambitions for Captain Buzz: with the sensors available on a smartphone, it should be possible to create the world's most advanced drone, with cutting-edge capabilities. Captain Buzz has already been the world's first drone to be flown entirely by a smartphone, to be entirely reprogrammed mid-flight and to be commanded by a smartwatch. Next, we aim to make Captain Buzz fly in situations where there is no GNSS (eg GPS) available. Thanks to the hardware wizardry of Brian Jones we now have a multiplexing board that will let us control multiple devices over a single audio channel, which should let Captain Buzz take the commands of a quadcopter or a swept-wing aircraft. Most of the limitations with Captain Buzz come from the current UK drone regulations that have strict altitude and distance limitations. We are hoping (and currently looking for a sponsor) to take Buzz on a foreign trip to perform test-flights under less rigorous legislation.

Captain Buzz is beginning to get some press attention: Ramsey [Faragher] spoke to the Naked Scientists about Captain Buzz as part of their Cambridge Science festival show, and he appeared at the BBC Make It Digital Weekend.

The Captain Buzz team would like to thank CSR for funding the initial materials and Google Inc. for providing Android handsets.

There are numerous videos of Captain Buzz on YouTube and you can follow the project on Google+: [google.com/+CaptainBuzzDrone](https://plus.google.com/+CaptainBuzzDrone).

Oliver Chick can be contacted at oc243@cl.cam.ac.uk. You can also see him talking about Captain Buzz at: <https://www.youtube.com/watch?v=7CdylwOSlt0>

An interview with Ramsey Faragher can be found at: <https://www.youtube.com/watch?v=DE5e0C7xw7c>

Hall of fame news

ARM

ARM has acquired Sansa Security a provider of hardware security IP and software for advanced system-on-chip components deployed in Internet of Things (IoT) and mobile devices. Israel-based Sansa Security enables security in more than 150 million products per year and its technology is deployed across a range of smart connected devices and enterprise systems.

ARM has also launched a new university alliance partnership in China that allows industry partners to develop high quality teaching materials based on their own technologies for engineering students. The hardware and software kits will be centered around ARM teaching materials and will offer the most up-to-date professional-standard platforms and tools. The programme will launch through partnerships with leading Chinese technology companies Beijing Chukong Technology Co. Ltd, the company behind Cocos2d/Cocos3d, one of the top global games engines, and GigaDevice Semiconductor (Beijing) Inc.

Bango

In H1 2015, Bango completed seven mobile payment agreements with Mobile Network Operators across Asia.

These agreements allow the operators to enable a feature in a mobile app store, such as Google Play or the Microsoft Windows Phone Store so that a smartphone user can pay for games, music, movies and other content on their phone bill.

Bromium

Bromium, a pioneer in micro-virtualization, is partnering with Microsoft to ensure that

Windows 10 will work with the company's micro-virtualization security enhancements.

Cambridge Coding Academy

Cambridge Coding Academy held a free two day workshop dedicated to expanding tech education opportunities for the Abbey Community, Cambridge.

The initiative, launched by Cambridge Coding Academy and partners Cambridge United Community Trust, Marshall Charity, The Raspberry Pi Foundation and The RSA, focused on helping students learn core coding concepts by building real world products. Following the Cambridge Coding Academy curriculum and methodology, students experienced pair-programming, created fully functional games, developed web apps to record game scores and gained new skills in HTML, CSS and JavaScript.

Emotion Sense Mobile Ltd

Dr. Neal Lathia, a Senior Research Associate in the Systems Group, along with colleagues in the Computer Lab and in Psychology, has founded Emotion Sense Mobile Ltd., a start-up focusing on harnessing behavioural data from smartphones and sensors for healthcare applications.

The team was awarded a 60k EPSRC follow-on-fund to commercialise the smartphone platform that has been developed over the last few years, and tested via publicly available apps that have been downloaded over 40,000 times to date.

After completing a market-research University i-Teams project in early 2015, Emotion Sense was accepted into Accelerate Cambridge at the Judge Business School where they are continuing to develop their business model, extending the

machine learning aspects of the platform, and are currently working with their first customers.

Jobstream

Microgen plc has acquired Jobstream Group Limited ('Jobstream') from LT Group Limited for a total consideration of £3.5 million.

Raspberry Pi

Giving someone a Raspberry Pi? Why not add the new Raspberry Pi course bundle?

The five-course bundle starts with an introduction to the Raspberry Pi. You'll play around with the hardware and learn how to perform basic computing functions before starting on the basics of Python. You'll learn how to retrofit your Pi into a Linux-powered walkie-talkie, add a keyboard and monitor to turn it into a low-cost computer, program it to control Christmas lights, build a motion-activated teddy bear, and make a Raspberry Pi-powered robot.

RealVNC

RealVNC®, the original developer and provider of VNC® remote access and control software, has launched its VNC Software Development Kit (SDK) for use with VNC Cloud. VNC SDK 1.0.1 is now available to download for free from RealVNC's new dedicated developer portal.

VNC technology facilitates remote access from one device to another over a local area network, VPN or the Internet. The SDK will provide developers with the tools to integrate remote access with existing software on Windows, Linux, Mac, iOS, Android and HTML5-compatible browser-based platforms.

Sophos

Sophos has launched Sophos Cloud Web Gateway, a cloud-based secure web gateway that delivers advanced protection for users, devices and data across multiple operating systems, regardless of their location. The addition of secure web gateway to Sophos Cloud integrates technology from Mojave Networks, which Sophos acquired in October 2014.

Spektrix

Key senior management moves reflect the company's rapid growth in the UK and North American markets. Co-founder Michael Nabarro (MA03) has become CEO and assumes responsibility for establishing the vision for the business and strategic oversight of the company's long term business plan. Spektrix's goal is to become the de facto technology platform for arts organisations across the globe. In 2014 more than 8.9 million tickets were sold using Spektrix's cloud-based platform, involving over a billion web hits.

SwiftKey

SwiftKey has become a member of the Unicode© Consortium, a non-profit organization that manages the Unicode Standard.

SwiftKey joins other respected technology leaders in the group, including Apple, Google, Microsoft, Oracle and Yahoo!, and will specifically be helping the Consortium with its emoji work. The Unicode Standard ensures the characters you type, including emoji, mean the same regardless of device (although visual representations may differ).

Trampoline

MedCity Map, the latest analytic platform from Trampoline, has been launched.

The platform provides live data and analytics for the thriving MedCity life sciences cluster spanning London, Cambridge, Oxford and South East England.

Ubisense

Magna Steyr has selected Ubisense Smart Factory for its primary vehicle manufacturing plant in Graz, Austria where it assembles the MINI Countryman, MINI Paceman, Mercedes-Benz G-Class and Peugeot RCZ. Four of the top five leading vehicle manufacturers and eight of the top 15 global automotive companies across Europe, Asia and the US rely on Ubisense Smart Factory to optimize their manufacturing processes.

Xsilon

Xsilon has successfully completed its technical field trials of its Hanadu technology, in partnership with the UK government's Department of Energy and Climate Change (DECC).

The trials took place in a variety of types of homes at multiple locations across the UK and achieved robust connectivity in 100% of the trial sites.

Job listing

August

NXP Semiconductors

- *Senior software engineer*

Tom Tom

- *Senior software engineer*

Ontoit.io

- *Software engineers*

Daiwa Capital Markets Europe

- *Developer Convertibles IT*

Linguamatics

- *Full stack developer*
- *DevOps engineer*

pebble {code}

- *Lead creative technologist*

July

Comply Advantage

- *Laravel PHP developer*
- *Python developer*
- *Natural language processing specialist*

Fospha

- *Prototype software engineer*
- *Senior software developer*

Oak OTC

- *.NET developer*

If you have a job advert that you would like included in the weekly listing, please send the details (as a word doc) to cam-ring@cl.cam.ac.uk

Research Skills course

Ivan Trendafilov: Fighting advance fee fraud spam: an unconventional approach

Advance fee fraud (AFF) emails are defined at the intersection of spam and social engineering. Like regular spam, AFF emails are sent in bulk to a large number of recipients; unlike traditional spam messages, their purpose is not to sell products, but to engage the recipient in a conversation and convince him to advance money with the promise of a significant later financial gain. AFF scammers usually prey on some of the most vulnerable members of society — the elderly, uneducated or financially burdened. Chatham House Research estimates that AFF-style fraud costs the UK economy £150 million annually [Peel, 2006]. AFF emails are sometimes referred to as Nigerian emails, although this term may be confusing as modern AFF scammers operate from all around the world.

Traditional spam is usually fought with a combination of hand-written rules and statistical classifiers; we decided to attempt a markedly different approach. AFF scams demand significant effort from the perpetrator — one has to read, reply and monitor the state of each conversation thread. Ideally, the scammer wants to maximise his time spent on viable targets. We take advantage of that and built a fully autonomous conversational agent designed to pretend to be a potential target and keep scammers occupied for as long as possible. As the agent wastes the scammers' resources, this helps dilute the pool of potential victims and lowers the overall probability of a payout.

On a high level, the agent consists of five major components — collection, information extraction (IE), classification, identity generation (IG) and response generation (RG). Collection consists of several crawlers and aims to push new AFF messages into the system. IE processes these emails to find all named entities, as well as their roles and relations (most scams feature several actors). This helps ensure the reply generated in RG is sent to the correct address and actor. Classification uses several MaxEnt classifiers to determine the conversation state, as well as which of the 22 known AFF variations is being used, while IG associates a unique identity with each conversation, including a dedicated email address and any personal information that may be

exchanged during the conversation. Finally, the response is generated using outputs of the previous components, a bank of small, templated text snippets and a hierarchy of probabilistic finite state machines.

We evaluated the performance of the agent over a 10-day period of operation and observed a participation rate of 58% and average thread length of 6.20 messages, compared to 70% and 7.40 for human baseline performance [Trendafilov, 2012]. Whilst human performance is clearly superior at this task, it is worth noting that it takes a human at least 5 minutes to compose a good reply to one of these emails, whilst the system can process a message in less than 10 seconds, up to 8,640 a day. A larger study might be appropriate to find out if scammers are likely to adapt and become more discriminative when selecting their targets.

[Peel, 2006] Peel, M. (2006). Nigeria-related financial crime and its links with Britain. Chatham House Research

[Trendafilov, 2012] Trendafilov, I. (2012). Autonomous conversational agent for advance fee fraud spam, <https://github.com/IvanTrendafilov/ug4-report>

The best essays from the Research Skills module of the MPhil in Advanced Computer Science course 2014/2015 are being published in 'The Ring'. This is the second of these essays.

Computer Laboratory news

Cambridge Cloud Cybercrime Centre

The Computer Laboratory, in conjunction with the University's Institute of Criminology and Faculty of Law, is launching the Cambridge Cloud Cybercrime Centre. The multi-disciplinary initiative, whose objective is to create a 'sustainable and internationally competitive centre for academic research into cybercrime', will be operational from 1 October 2015.

The team is headed up by director Richard Clayton, and also comprises professors across the various departments, including: Ross Anderson, Professor of Security Engineering at the Computer Laboratory; Simon Deakin, Professor of Law at the Faculty of Law; and Lawrence Sherman, Wolfson Professor of Criminology at the Institute of Criminology.

Joining them are Alastair Beresford, Senior Lecturer at the Computer Laboratory and Alice Hutchings, post-doctoral researcher at the Computer Laboratory.

The Centre is currently advertising a number of research positions.

Deception

At the end of August 2015, The Computer Laboratory hosted Deception, an international conference on deceptive behaviour.

The scientific committee for Deception 2015 comprised 19 top deception researchers from different disciplines, including: Ross Anderson, Professor of Security Engineering at the Computer Laboratory; Professor Peter Robinson, Professor of Computer Technology at the Computer Laboratory; and Sophie Van Der Zee, a post-doctoral researcher in the Security Group at the Computer Laboratory.

Sophie is part of the research team that has developed a lie detector set to revolutionise

interrogation techniques. It works by measuring the tiny tell-tale body movements people tend to make when lying and offers more consistent accuracy than the traditional polygraph.

The team's lie detector, a full body motion capture suit, has 17 sensors which record movement up to 120 times per second in three dimensions for 23 joints.



An interviewee wearing the motion capture suit

Said Professor Ross Anderson "Put simply, guilty people fidget more; and this turns out to be fairly independent of cultural background, cognitive load and anxiety — the factors that confound most other deception detection technologies."

The Cambridge team is also working with researchers from Lancaster and Utrecht University.

University Open Days

In July 2015, The Computer Laboratory participated in the University's Open Days, opening its doors to prospective students, parents, guardians and teachers. Attendees were treated to student project and faculty research demonstrations, as well as a subject and admissions talk.

Slides from the subject and admissions talk can be found on the Lab's website.

Coding Summer School for Girls

The Computer Laboratory, in conjunction with Cambridge Coding Academy, held its inaugural summer school for girls.

The one-week summer school gave the young programmers with little or no prior coding experience the opportunity to design and develop an online game, build Instagram-like image filters and program drones to fly.

The event was a great success and achieved its aim of sparking an interest in computer science.



"We were really impressed with how excited, interested and creative the girls were," said Dr Robert Harle. "Starting from nothing, they were able to build a simple web game and then independently add new gameplay options, graphics, scoring mechanisms and all sorts of great additions we had never thought of."

The school was free thanks to sponsorship from Sophos, CSR, RealVNC, MSR and a personal donation from David Singleton (BA02).