SAMBa

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SPECTRA ANALYTICS

SAMBa Conference 2022

July 5th - 6th 2022

4 West University of Bath

UNIVERSITY OF BATH

UKRI Engineering and Physical Sciences Research Council

WELCOME ADDRESS

Hello and welcome to the 6th Annual SAMBa Summer Conference! We hope you're excited for an action packed two days full of talks, posters, and (most importantly) fun. This is our first fully in-person summer conference since the beginning of the pandemic, and we are so thrilled to be opening our doors to you all once again! This conference is a celebration of all things SAMBa, and the amazing work that is done by the students in the CDT. Over the next two days you will see a selection of some of the research that is currently being conducted by our students in the form of talks, posters, and also short lightning presentations by our cohort 8 students, who will be starting the PhD stage of the SAMBa programme come October. We could not be happier to showcase the amazing talent that we have in our department.

We are also thrilled to welcome our four wonderful keynote speakers; Jane Hutton (University of Warwick), Radek Erban (University of Oxford), Cameron Hall (University of Bristol), and Katie Steckles (University of Manchester). We feel very fortunate to have such an insightful group of keynote talks that are at the very heart of statistical applied maths, and touch on some of the ethical considerations of our research and how to communicate our research more effectively. We want to thank our external speakers for accepting our invitation to speak and for their cooperation over the past few months!

We are also so delighted to have Spectra Analytics on board as our sponsors this year! Spectra Analytics are an AI software and consultancy firm established from the University of Warwick. They work with organisations across a broad range of industries to help them extract value from their data and aim to be a bridge between academia and industry, translating research into real world impact. SAMBa first collaborated with Spectra Analytics for ITT 13 (January 2021), and it is wonderful to see the relationship and connections made during that week are still going strong.

We also want to extend the hugest thank you to Susie (one of our co-directors), Lindsay (our operations officer), and Lou (our coordinator) for all their help and support in organising this event. We truly couldn't have done it without them. A special thank you to the members of the previous summer conference organising committees also for all their advice and guidance, which was much appreciated.

Lastly, we would like to thank the PhD students who have contributed to this conference for all the time and effort they have put in, many of whom are presenting for the first time. We hope you enjoy the experience and find it valuable!

Organising this conference has been such a privilege, and we hope that you enjoy the conference as much as we have enjoyed planning it!

Carmen van-de-l'Isle, Fraser Waters, Jenny Power, Matthew Pawley, Seb Scott
(The SAMBa Conference 2022 organising committee)

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The Committe

If you have any issues or questions, come find (or email) one of us and we will be happy to help!

CONFERENCE SCHEDULE

TUESDAY 5TH JULY

09:30	Arrivals and Registration	
09:45	Welcome Address	
10:00	**Keynote Talk: Jane Hutton** Epidemics, ethics and uncertainty: the roles of statistics versus mathematics	
11:00	Break	
11:15	Session 1a	11:15 - Abby Barlow 11:35 - Andrei Sontag
12:00	Break	
12:15	Session 1b	12:15 - Theodora Syntaka
12:35	Conference Photo	
13:00	Lunch	
14:00	**Keynote Talk: Radek Erban** Stochastic Modelling of Reaction-Diffusion Processes	
15:00	Break	
15:15	Session 2a	15:15 - Carlo Scali 15:35 - Yi Sheng Lim
16:00	Break	
16:15	Session 2b	16:15 - Christopher Dean 16:35 - Josh Inoue
17:00	**Poster Session** **Location**: 4W Level 1 Atrium	
18:00	Walk to the restaurant	
19:00	**Conference Dinner**: Hall & Woodhouse	

CONFERENCE SCHEDULE

WEDNSDAY 6TH JULY

09:30	Arrivals and Coffee	
10:00	**Keynote Talk: Cameron Hall** Keeping the lights on: Applied mathematics and the future of electricity	
11:00	Break	
11:15	Session 3a	11:15 - Piotr Morawiecki 11:35 - Cecilie Andersen
12:00	Break	
12:15	Session 3b	12:15 - Eileen Russell 12:35 - Kat Phillips
13:00	Lunch	
14:00	Lightning Talks	
15:00	Break	
15:15	Session 4	15:15 - Eric Baruch Gutierrez 15:35 - Fengpei Wang
16:00	Break	
16:15	**Keynote Talk: Katie Steckles** Communicating Mathematics	
17:15	Closing Remarks	

KEYNOTE SPEAKERS

JANE HUTTON ..... UNIVERSITY OF WARWICK

EPIDEMICS, ETHICS AND UNCERTAINTY: THE ROLES OF STATISTICS VERSUS MATHEMATICS

A few mathematicians have had considerable influence in the last two years over whether people lived and flourished, or died. Some mathematicians have focussed on designing and implementing mathematical models which only consider a single illness. Applied statisticians know that it is critical to first decide what the question is: "Minimise deaths from Covid-19?" or "Minimise deaths due to Covid-19 and our decisions this year?" or "Minimise the impact of Covid-19 on well-being over ten years?" The ethical status of an expert who gives a simple answer to the first question, without uncertainty or alternatives, will be examined.

Some publications by influential mathematics groups were directly misleading: in estimating cases of Covid-19, the assumption, made by prominent mathematicians, that PCR test had sensitivity of effectively 100%, and specificity of 80-90%, relied on gross misreading of the references cited. People were placed under effect house arrest, when, on balance of probability, they were innocent of covid.

Numbers of "covid" hospitalisations and deaths were quoted without reference to the usual daily numbers, and contributed to created a climate of fear. Predictions of 6,000 UK hospital admissions per day in January 2022 relied on the assumption that South African scientists are incompetent. Their statement that omicron variant of covid-19 has much lower admission and death rates was ignored. I will discuss whether this can be construed as racism, and compare the issues with ideas of racial inequity in UK covid death rates.

The uncertainty in diagnostic tests, missing information and measurement errors all feed into transmitted variation. Even in manufacturing glass beads, the variation from engineering specification is not simply determined by considering width, for example, alone. Despite this, mathematical predictions of covid cases were used to justify lockdowns even in countries where people would starve as a consequence. Some statisticians have tried to estimate the damage to children's education and wellbeing, and illness and deaths due to lack of access.

I argue that such mathematical modelling cannot be justified within virtue, deontological, utilitarian or care ethics, though Zoroaster or Nietzsche might be invoked. It is always necessary to consider the wider context, and the probable consequences of actions, as explained in the International Statistics Institute Code of Professional Ethics. Assessment of the validity of model assumptions, data quality, adequacy of the fit of models and accuracy of predictions is essential, and essentially statistical.

KEYNOTE SPEAKERS

RADEK ERBAN ..... UNIVERSITY OF OXFORD

STOCHASTIC MODELLING OF REACTION-DIFFUSION PROCESSES

Stochastic reaction-diffusion simulations have been successfully used in a number of biological applications, ranging in size from spatio-temporal modelling in molecular and cell biology to stochastic modelling of groups of animals. I will discuss connections and differences between various stochastic reaction-diffusion methodologies, between stochastic and deterministic modelling, and some interesting open mathematical problems. The methods covered will include Brownian dynamics, compartment-based (lattice-based) models, and (all-atom and coarse-grained) molecular dynamics simulations

CAMERON HALL ..... UNIVERSITY OF BRISTOL

KEEPING THE LIGHTS ON: APPLIED MATHEMATICS AND THE FUTURE OF ELECTRICITY

Mathematical modelling and data analysis underpin practically every aspect of power generation, storage, and supply. On a microscopic scale, mathematical techniques are used to optimise the design of batteries and battery materials; on the macroscopic scale, models are used to ensure the stability of power grids and develop plans for what to do when the unexpected happens. In this talk, I will take a tour through a few problems where mathematics is making an impact on how we understand and control electricity, and where mathematics has the potential to play a major role in the future as we move towards a net-zero world.

KATIE STECKLES ..... UNIVERSITY OF MANCHESTER

COMMUNICATING MATHEMATICS

Mathematics is a difficult subject to communicate, from the abstract ideas and complicated topics it involves, to the public perception of maths as a subject that's difficult and boring - but it's so important to engage people with mathematics, share our love of the subject and communicate how useful and important maths is. Join mathematician and communicator Katie Steckles to hear the story of her 12-year career in outreach, as well as some tips and suggestions for how to get involved in outreach, and make your maths communication engaging and effective.

SESSION INFORMATION

POSTER SESSION

Tuesday 5th July, 17:00-18:00

The poster session will be held in the 4 West atrium on Tuesday evening. We have.a selection of students from a variety of years in SAMBa displaying their research in the form of a poster. This event presents our students with the opportunity to design a poster that can effectively communicate their research in a condensed matter, and to discuss their research with other PhD students and academics. We have a fantastic selection of posters on display so make sure to check them out and cast your vote for your favourite poster!

LIGHTNING TALKS

Wednesday 6th July, 14:00-15:00

This informal event gives our first-year SAMBa students the chance to present their research in a fast-paced and concise way. The rules of the lightning talks are simple. Each student has three minutes to speak about a piece of research they have conducted, accompanied by a single slide. The topics vary from research they have conducted in the first year of SAMBa, to masters' projects, and plans for the PhD stage of SAMBa. These talks will give a quick snapshot into a piece of research, and not be too detailed. After three minutes the students will be informed time is up (attend the event to see how) and will have to stop talking. The goal is to summarise something technical in a short and accessible way, and to make the most of the time allowed - too short a talk and they leave time for questions from the audience, too long and they'll be cut off (potentially even mid-sentence). As you can imagine, this is going to be a chaotic (and most importantly fun) event, so do come along!

STUDENT SPEAKERS

SESSION 1: TUESDAY 5TH JULY 11:15 - 12:35

Abby Barlow ..... SAMBa Cohort 7

The role of households and neighbourhoods in the early stages of an epidemic

Andrei Sontag ..... SAMBa Cohort 7

Awareness spread and the effects of (mis)information on epidemics

Theodora Syntaka ..... SAMBa Aligned Cohort 7

Long term behavior: From particle dynamics through kinetic equations to fractional diffusion equations

SESSION 2: TUESDAY 5TH JULY 15:15 - 17:00

Carlo Scali ..... SAMBa Cohort 6

Weakly quenched scaling limit for the one-dimensional, biased random walk on heavy-tailed conductances

Yi Sheng Lim ..... SAMBa Cohort 6

An operator approach to high-contrast homogenization

Christopher Dean ..... SAMBa Cohort 6

Pólya urns with growing initial compositions

Josh Inoue ..... SAMBa Cohort 6

Spatio-temporal Change-point Detection

STUDENT SPEAKERS

SESSION 3: WEDNESDAY 6TH JULY 11:15 - 13:00

Piotr Morawiecki ..... SAMBa Cohort 6

Mathematics of floods: developing an asymptotic framework for the unification of rainfall-runoff models

Cecilie Andersen ..... SAMBa Cohort 7

Selection mechanisms and complex singularities in the falling jet problem

Eileen Russell ..... SAMBa Cohort 5

Faraday Wave-Droplet Dynamics

Kat Phillips ..... SAMBa Cohort 6

Lubrication layer cushioned capillary-scale rebound dynamics

SESSION 4: WEDNESDAY 6TH JULY 15:15 - 16:00

Eric Baruch Gutierrez ..... SAMBa Aligned Cohort 5

Random Primal-Dual Method with applications to Parallel MRI

Fengpei Wang ..... SAMBa Cohort 6

What can we do with the large scale optimal transport problem?

View the full abstracts on our conference website!
https://people.bath.ac.uk/ss2767/SAMBa-Conf-2022.html

#BeThe Change

Ending Harassment

CODE OF CONDUCT

UNIVERSITY OF BATH

SAMBa

We invite you to this confence in a spirit of curiosity, friendliness, open-mindedness and respect. We value your participation and want to ensure a welcoming and safe environment for all. In line with the University of Bath's policy, we will not tolerate harassment in any form. All participants at our event are required to agree to the following code of conduct.

Need Help?

If you are being harassed, notice that someone else is being harassed, or have any other concerns, please speak to one of the organisers (see page 2) or email samba@bath.ac.uk.

Summary

- Our conference is dedicated to providing a harassment-free experience for everyone, regardless of gender, gender identity and expression, sexual orientation, age, disability, appearance, race, ethnicity or religion.
- We do not tolerate the harassment of participants in any form.
- Participants asked to stop any harassing behaviour are expected to comply immediately.
- Participants violating these rules may, at the discretion of the organisers, be asked to leave the conference.

Be aware

Harassment includes the following:

- Offensive verbal or written comments related to gender, gender identity and expression, age, sexual orientation, disability, physical appearance, race, ethnicity or religion.
- Deliberate intimidation, stalking, invading personal space, harassing photography or recording, sustained disruption of talks or other events.
- Inappropriate physical contact, persistent and unwelcome sexual attention.
- Solicitation of emotional or physical intimacy accompanied by real or implied threat of professional harm, and/or offering professional favours for compliance.

This list is not exhaustive, please see our website for further details.

Staff and committee will be happy to help participants experiencing harassment feel safe for the duration of the conference. This may include contacting security, contacting local police, or providing an escort. We expect participants to follow these rules at the conference venues and related social events.

More information

Please see our website for the following resources:

- University of Bath Dignity & Respect Policy
- University of Bath Guide: Sexual assault or harassment
- Be The Change - tackling harassment
- University of Bath Campaign: being treated with dignity and respect

WELLBEING

Returning back to in-person events after being online for so long can be really daunting, as can presenting for the first time, or the first time in a while. If you are feeling overwhelmed and want someone to talk to, please feel free to reach out to a member of committee, we'd be happy to lend an ear.

Here are some self-regulation and grounding techniques that you also may find useful. Most of these techniques work by helping you guide your attention back into the present moment, re-orienting your focus to what is happening right now, either physically in your body or in your surroundings..

Rectangle Breathing

Breathe in as your draw the short side of the rectangle, breathe out as you draw the long side of the rectangle.

3-minute breathing space

1. What is going on for me right now? Thoughts, feelings, sensations.
2. Draw attention to my breathing. Notice where I feel the breath in my body.
3. Expand attention out to include the sense of my whole body, sitting, breathing, present.

54321

Name:
5 things that you see
4 that you feel or touch
3 that you hear
2 that you can smell
1 that you can taste

STOPP

Stop.
Take a breath.
Observe (what is going on for you).
Perspective-taking - Look around you, take in the bigger picture.
Proceed - What do I need in this moment? Air? Water? Food? A friend?

Puzzle Corner

Life can be stressful! Take a break, do a puzzle

SUDOKU

THE RULES

- Fill in the 9x9 grid with the numbers 1-9
- Each row, column and 3x3 outlined square must contain the numbers 1-9 without repetition.

3					9			5
			3	1		4	6	
			7					
					2			
6		7	1	3				
			5				7	2
								3
9				4		7		
	8			2			9	

BUCHSTABENSALAT

THE RULES

- Fill the grid so each column and row has one A, one B, and one C.
- The letter at the beginning of a row/column indicates the first value that appears in that row/column.
- The letter at the end of a row/column indicates the final value that appears in that row/column.
- Note: there will be blank squares

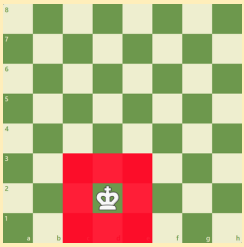
	A	B		
C				A
B				
C				A
		C		

MIRACLE SUDOKU

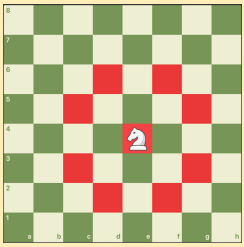
		1						
						2		

THE RULES

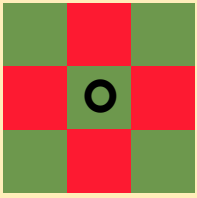
- Normal Sudoku rules apply.
- Any two cells separated by a knight's move or king's move (in chess) cannot contain the same digit.
- Any two orthogonally adjacent cells cannot contain consecutive digits



King's Move



Knight's Move



Orthogonally Adjacent Cells

WORD SEARCH

S	F	X	D	Y	Z	E	M	E	C	H	A	N	I	C	S	W	O	N	W
K	L	A	G	N	V	N	A	I	S	E	Y	A	B	O	S	S	L	H	Z
E	U	Y	N	P	H	R	X	Z	R	L	I	Y	N	F	G	E	K	S	A
N	I	A	I	B	I	O	L	O	G	Y	G	E	D	Q	M	S	P	F	P
G	D	B	N	A	O	R	I	E	Q	Z	Y	U	L	M	U	W	M	X	P
P	S	G	R	L	R	S	S	F	N	Y	R	Z	A	P	X	H	E	F	L
N	B	N	A	G	J	T	T	E	Y	O	T	K	I	H	V	M	J	Q	I
A	W	O	E	E	G	J	O	U	J	U	E	K	R	B	F	E	S	X	E
I	Q	I	L	B	N	G	C	D	W	Z	M	J	E	F	F	L	B	N	D
N	Z	T	E	R	F	L	H	K	H	E	O	R	M	M	L	B	G	M	A
V	S	A	N	A	F	D	A	B	E	M	E	K	U	R	Y	O	R	F	G
E	R	S	I	P	X	Y	S	C	U	N	G	Z	N	K	J	R	N	J	N
R	G	I	H	V	J	Y	T	G	I	Q	G	O	Z	H	W	P	G	Q	S
S	X	M	C	M	G	T	I	D	G	T	F	B	R	P	C	F	D	I	X
E	O	I	A	Z	P	B	C	P	L	K	S	R	L	O	M	D	S	E	W
V	O	T	M	M	A	T	H	E	M	A	T	I	C	S	R	Y	L	M	Q
T	B	P	Z	I	C	G	X	H	B	A	A	G	T	R	L	C	U	D	C
R	W	O	T	Q	E	L	A	F	A	U	F	Q	P	A	L	N	K	U	J
U	H	U	J	D	C	Y	E	R	N	R	R	L	N	T	T	O	S	R	P
P	R	O	B	A	B	I	L	I	T	Y	M	A	J	S	Z	S	G	C	Z

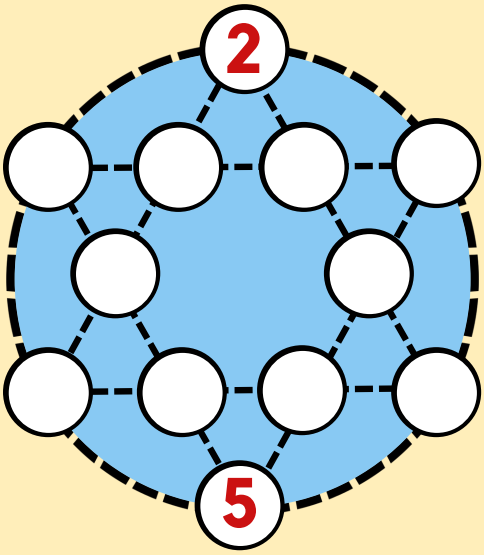
- algebra
- analysis
- applied
- bayesian
- biology
- fluids
- geometry
- inverse
- lemma
- machine learning
- mathematics
- mechanics
- numerical
- optimisation
- PDE
- probability
- problem
- statistical
- stochastic

Find the words given on the right. They can appear vertically, horizontally, diagonally, forwards and backwards.

STELLAR SUMS

THE RULES

- Fit the numbers 1-12 in the circles on the diagram.
- The numbers on each side of the star (every row of 4 circles), and the numbers at the six points of the star must sum to the same total






Thank you so much for coming to our conference and we hope you have enjoyed! Please share you thoughts and photos with us using the hashtag below!

SAMBa

#SAMBACONFERENCE22

@SAMBa_CDT

samba@bath.ac.uk.

Huge thank you to

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