

# EiM

Cambridge University  
**Ethics in Mathematics**  
Society

*invites you to*

Ethics for the Working Mathematician

Michaelmas 2019



Tuesday 15 October, 1600, MR4

### **An introduction to ethics in mathematics and why it is important**

Mathematicians sit at the heart of technological advancement and industrial progress. Mathematics is a universal tool. It can be used for good, and it can be used for harm. To begin, we look at where harmful situations may arise, and what exactly we as mathematicians are doing to contribute to that harm. Though this harm may not (necessarily) come from intentional malice, there are many situations, and people, who can influence and manipulate us into carrying out harmful acts as mathematicians. It is important to be able to recognise and react to these scenarios, as we cannot always rely on external forces such as management to guide what we do.

Tuesday 22 October, 1600, MR4

### **Financial Mathematics and Modelling**

We all know about examples of mathematicians misbehaving in finance, and even being jailed as a result: Tom Hayes and Ke Xu are two examples. But more subtle are the modelling tools mathematicians produce. Mathematical modelling is ubiquitous in understanding the way the world works, from finance to physics to climate patterns. Understanding how to develop and use a model, as well as its limitations, and the way it interacts with the world, is indispensable in preventing it from causing harm. Unfortunately, as we saw in the financial crash of 2007, such models are sometimes poorly understood, with devastating consequences.

Tuesday 29 October, 1600, MR4

### **Cryptography, surveillance and privacy**

Mathematicians have always played a central role in the making, and breaking, of cryptography. We also play a key role in developing surveillance tools, both for state actors and private organisations. Thus, we have several ways of enabling the infringement of the privacy of others. We can do so deliberately, by designing tools to break strong encryption, or indirectly, by creating systems and platforms which collect massive amounts of personal data of individuals. And we can do it accidentally, by being careless or sloppy in the way we store the data of others. In all of these cases, our work determines how much privacy people can have.

Tuesday 5 November, 1600, MR4

### **Fairness and impartiality in algorithms and AI**

Algorithms run the world, and mathematicians are designing them. Algorithms decide what people read, what they buy, and when then can get a loan. We often design these systems to remove human subjectivity from decision making processes and to make them impartial, as is being done with predictive policing algorithms and prison sentencing algorithms. But how impartial, or fair, can a system designed by humans ever be? Moreover, the internet and big data have given rise to massive new potential, from targeted political advertising as done by Cambridge Analytica, to AI technology such as deepfake videos and self-driving cars. Our “solutions” in these instances can bring about a whole new set of problems.

Tuesday 12 November, 1600, MR4

### **Regulation, accountability, and the law**

The work of mathematicians in industry is now very close to its tangible applications; we produce output that is extremely quick and easy to use. Just look at machine-learned algorithms that compute credit scores. Now that we sit so close to the applications, we need to consider

what sort of responsibility we have. There are things we are, and aren't, legally allowed to do. And there are consequences we might face if we fall foul of the law. Moreover, given that our work is often cutting-edge, we must self-regulate to prevent the types of harm that legislators and others have yet to realise is even possible.

Tuesday 19 November, 1600, MR4

### **Understanding the behaviour of the mathematical community**

Just like every other academic field, mathematicians form their own community, with their own conventions, common beliefs, and schools of thought. We hand our teachings down through the generations, and this process goes all the way back to Euclid. But the ways of thinking we employ when doing mathematics in an abstract research setting may not serve us well in an industrial setting. It is important to be aware that not all the actions that make us good at mathematics will necessarily lead to us producing good solutions to industrial or social problems. In fact, some of our ways of viewing and approaching problems will hold us back when working outside academia.

Tuesday 26 November, 1600, MR4

### **Psychology 101: How to survive as a mathematician at work**

All mathematicians will, eventually, form some part of the workforce. The abstract nature of mathematics may lead us to believe that our role is "special", and that we won't need to worry about the usual workplace interactions, issues, conflicts and dangers that may arise in other professions. This is simply not true. We face the same issues, and need to know how to deal with them. Our focused and dedicated nature means that we may easily overlook instances of others trying to exploit or manipulate us at work, resulting in harm to ourselves, and our work becoming harmful to wider society. We need to know how to identify such people and situations, and to protect ourselves against them.

Tuesday 3 December, 1600, MR4

### **Looking into the future, what more can mathematicians do?**

Being aware of the ethical issues that you as a mathematician may face is an extremely important step. But this is only the first in a sequence of potential steps. You can take this further, by starting to tell other mathematicians you work with or interact with. You can try and get involved with decision-making processes, by taking a seat at tables of power and authority. And you could even work towards identifying the unethical behaviour of other mathematicians completely unrelated to you, and call out their harmful actions to the community and to the public. This is fairly new and uncharted territory for mathematicians, and they're exactly the sorts of activities we shy away from. But now is the time to step up and take responsibility, because if we don't do it, then no-one else will.

All of these lectures are given by Dr Maurice Chiodo in the Centre for Mathematical Sciences.

The Society will arrange refreshments during each of them.

## About us

Mathematics is one of the most fundamental areas of human study. It is both the language and the tool that connects our abstract understanding with the physical world. Today it lies at the heart of all technological developments and its universality is unquestionable.

We see mathematics as a tool for doing good, because we can find good and useful things to do with it. It is clearly used as a way for humans to understand, change, direct and manipulate the world around us. But, although it can be used for good, its misuse can have harmful consequences. Indeed, those who have the greatest ability to understand and manipulate the world hold the greatest capacity to damage and inflict harm, often without realising or intending to do so.

We are the Cambridge University Ethics in Mathematics Society, and we are here to help mathematicians recognise the ethical questions that can arise when doing mathematics. By promoting and hosting lectures, talks and discussions we hope to give mathematicians some of the insight and tools that they will need to deal with ethical issues in their work.

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<https://lists.cam.ac.uk/mailman/listinfo/soc-cueims>

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