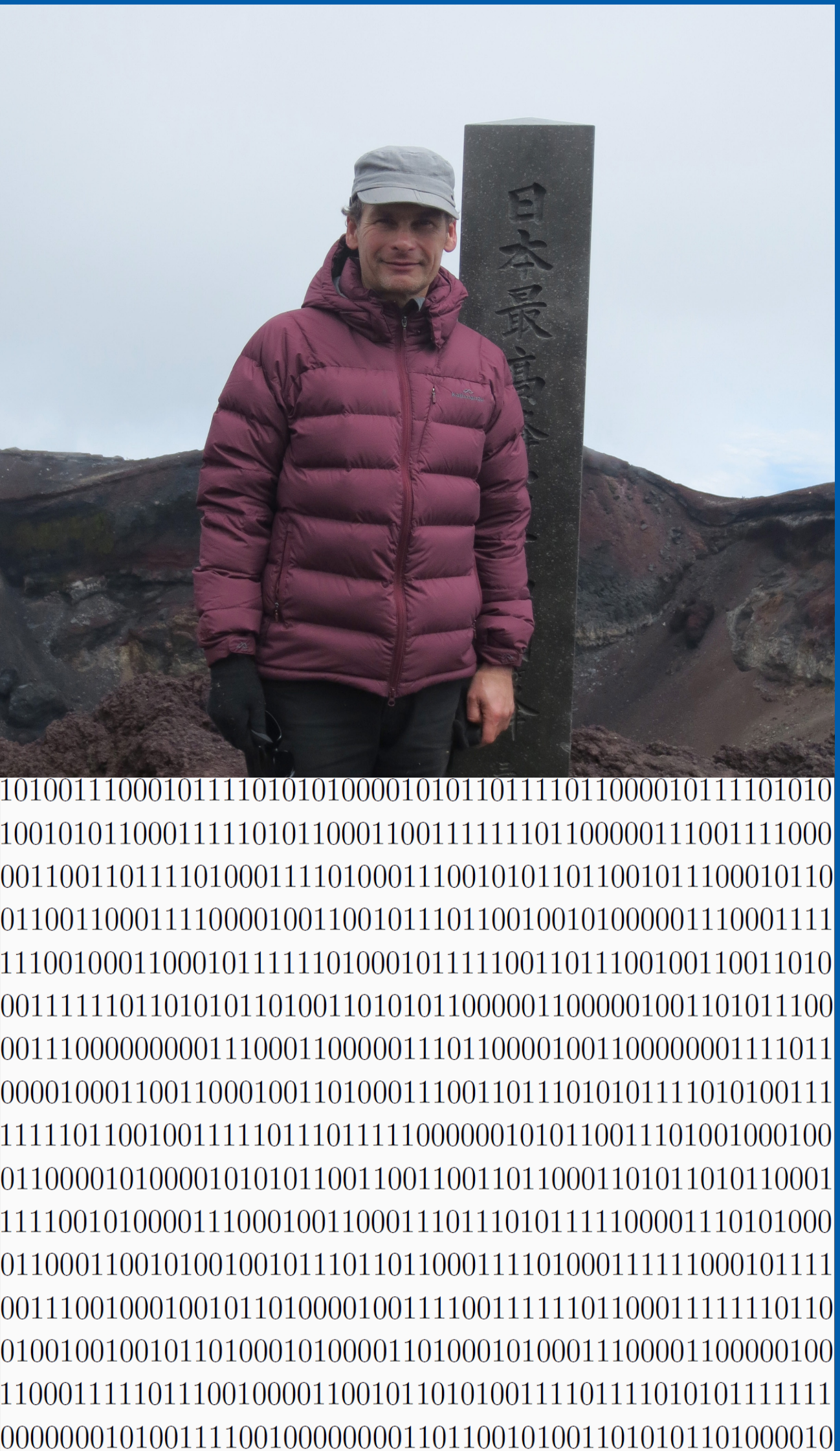
THE UNIVERSITY OF AUCKLAND
FACULTY OF SCIENCE
Department of Computer Science

Compression and Randomness

Inaugural lecture by Professor Andre Otfrid Nies

Department of Computer Science, the University of Auckland



We have an intuitive idea of when a finite object is random: a sequence of bits obtained by 856 coin tosses is random, while a sequence of 856 zeros is not. To obtain a formal definition, we observe that the first sequence is random because no shorter description than the sequence itself is possible. The second sequence is highly compressible because the description "856 zeros" is much shorter than the sequence itself. For finite objects, randomness means incompressibility.

Mathematics studies interesting finite objects, such as groups (used to describe symmetries) and graphs (used to describe relationships). Such objects are described by first order sentences from logic. Are these objects random, highly compressible, or in between? We show that groups are always highly compressible, graphs sometimes are not.

Some key results of my work relate to the randomness spectrum. An infinite random sequence of bits, viewed as the binary expansion of a real number z, is unexpectedly well-behaved: for instance each nondecreasing function that is computable by algorithm is differentiable at z.

A far-from-random infinite sequence can be incomputable by algorithm, but is very weak when used as an auxiliary device for computations.

5pm, Thursday 16 October 2014
Lecture Theatre SLT1, Building 303
38 Princes Street
The University of Auckland

Refreshments to follow in the Level 4 Common Space

All are welcome to attend.

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