

Mathematics—INFOSAM2020

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“The future belongs to those who prepare for it”

Previous predictions about IT

- **I think there is a world market for maybe five computers** (Thomas Watson, Chairman of IBM, 1943)
- **Computers in the future may weigh no more than 1.5 tons** (Popular Mechanics, 1949)
- **There is no reason anyone would want a computer in their home** (Ken Olson, President, Chairman and founder of Digital Equipment Corporation, predecessor to Microsoft, 1977)

Even short-time predictions may be hard

- **Internet är en fluga som kanske blåser förbi. Jag tror inte att folk i längden kommer att vilja ägna så mycket tid, som det faktiskt tar, åt att surfa på nätet."**

Ines Uusmann, kommunikations- och IT-minister, 1997

- **Om två år ska 98 procent av hushållen ha tillgång till bredband.**

Björn Rosengren, näringsminister, 2000

Predictions about 2019, by the Swedish Academy for Technological Sciences (IVA) in 1969

- Man on Mars in 1985
- But: Remarkable predictions about elementary particle physics, semi-conductors, superconducting, telecommunications, “internet”, transportation
- IVA’s bold 50 years’ vision gives hope for INFOSAM2020!

Main issues considered by the working group

- Mathematics —a broad perspective, and implications for the future of Mathematics
- Mathematics and Computer Technology
- Observations and predictions (non-mathematical) concerning boundary conditions for teaching and research at NTNU in 2020

Mathematics from Newton to the twenty-first century

- From the invention of calculus, physics and mathematics have been developed in close interplay; in the early days and well into the nineteenth century no real distinction between “pure” and “applied” mathematicians
- The “pure” mathematics of the twentieth century—an important intellectual liberation
- End of the twentieth century: Return of “pure” mathematics to applied areas

Pure and Applied Mathematics

- No area is “safe” from the influence of mathematics, and no area of mathematics is “safe” from being potentially applicable
- “I always loved that word Boolean”
(Claude Shannon, 1992)
- Examples of the “purest” of mathematics going applied: Algebra, Number Theory, Algebraic Geometry
- The notions of “pure” and “applied” mathematics are *time dependent*; serious mathematics should not be considered “useless”

Implications

- Keep the long-time perspective that serious mathematics is important and potentially useful
- NTNU should maintain and develop its excellence in the field, cf. the 2002 evaluation report of the Research Council of Norway concerning basic research in mathematics in Norwegian universities and colleges

“Too few people recognize that the high technology so celebrated today is essentially a mathematical technology”

Edward E. David, President of
Exxon Research and Development

Mathematics and computer technology

- As a result of modern computer technology, numerical and statistical computations are becoming essential components in an increasing number of fields
- Research in biology, chemistry, geology, physiology, etc. depends more and more on computer simulations; as a result, such fields are getting “mathematized”, and the mathematics needed becomes more advanced
- Gains in problem solving power is due to the growth of raw computing speed **as well as** to improvements in mathematical algorithms
- The use of modeling and computations, as a supplement or alternative to physical experiments, will become increasingly important

Strategic implication

- Mathematicians and statisticians at NTNU should contribute to the “mathematization” of scientific and industrial research and be relevant and active participants in this development; the potential for interdisciplinary research is larger than ever, thanks to computer technology

Non-mathematical predictions

- No revolution will take place concerning ways of learning (there will be no effortless way of learning)
- Printed text will still be important
- There will be full convergence of all means of communication
- Proper and rapid treatment of information will become even more vital

More predictions

- Norwegian students will still mainly go to their local universities (It is **vital** that NTNU continues to be an exception)
- All teaching of science and engineering at universities will take place in English
- At least one of our predictions will be blatantly wrong

A safe prediction

- The number of students: Our students in 2020 are already born!