

COMBATING THE CONSEQUENCES OF CLIMATE CHANGE



Our competitive advantage is that we have based our business on original and groundbreaking basic research. We are more than "just" good at what we do. We have made research breakthroughs and translated our knowledge into practice.

LARS ARGE
CENTER FOR MASSIVE DATA ALGORITHMICS (MADALGO)



Photo: Morten Mejlhede Rolsted

COMBATING THE CONSEQUENCES OF CLIMATE CHANGE

It was not in the cards that a Center of Excellence in computer science would contribute solutions that would make climate change easier to manage. Nonetheless, this story aptly illustrates how solutions and crucial input can come from an unexpected source.

Flooded basements and sewers, temporarily closed roads and railways, and astronomical insurance and restoration bills, are some of the consequences of the extreme weather caused by climate change. Climate change is causing water to pour from more than the skies; flooding from the ocean is threatening coastal areas as ocean water rises in sync with global warming. The weather is difficult to change, but if the flood-prone areas are known in advance, we can take precautions that will save individuals and society a lot of trouble and expense.

Flash Flood Mapping: A commercial success

It is tools that can supply precisely this knowledge that the software company Scalable Algorithmics (SCALGO) have developed. SCALGO is a spin-out from the Center for Massive Data Algorithmics (MADALGO) at Aarhus University. The center is managed by Professor Lars Arge, who is also a founder of SCALGO.

"It gives me enormous personal satisfaction to see our research used in practice and that it makes a difference to people," he says.

And that difference is quite tangible. SCALGO has not only developed unique software sold to both private companies and public institutions, but it has also calculated the consequences of rising sea levels on behalf of the Danish Ministry of the Environment. Furthermore, in cooperation with COWI, SCALGO has developed the Flash Flood Mapping tool (Skybrudskort@ in Danish), which shows the areas where flooding can be expected during extreme rain. This is useful knowledge for someone considering buying a house or installing new roof gutters or drainage systems, but it is also a tool that local authorities and regions can use to benefit their climate change planning. With extreme weather as a factor to be reckoned with, local Danish municipalities and regions clearly need to know where rainwater will go and where to initiate response measures. This knowledge is vital when they plan new urban areas, prioritize sewer renovation, assess house prices, divert road water, and much more.

As a result, the Flash Flood Map has already been sold to more than ten local authorities and the entire Central Denmark Region, and the map is being developed to cover all of Denmark.



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Combating climate change

The Flash Flood Mapping tool can make it easier to tackle some of the challenges posed by climate change. However, MADALGO research is neither on climate change nor hydrology. Most of the center's researchers are computer scientists, and the center is among the world's best at processing large amounts of data. This ability and knowledge has many potential applications, and the spin-out SCALGO was established to develop and exploit the commercial aspect of the center's research.

"We have not done any research into climate change or flooding but we know something about handling massive amounts of data, which is previously what is needed in the realization of a realistic flash flood mapping tool," explains Arge.

In theory, the consequences of a given amount of rainfall are actually not that difficult to estimate. Water always runs downhill, and if the terrain conditions are known it should be relatively simple to calculate where the water will accumulate and where the risk of flooding is greatest. The terrain conditions in Denmark are well known and well described. For example, COWI has surveyed the entire country and produced a terrain model with a 2x2-meter resolution. The model divides Denmark into 26 billion cells with a height each that can be used to calculate where the water will run during extreme rain. This detailed terrain model is necessary to be able to calculate precisely where rainwater runs, but the plethora of data was also what made the task impossible to solve until SCALGO came along.

Research foundation offers a competitive edge

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"What drives me as a scientist is the desire to understand and know more," Arge points out. "But when you gain new insight, I think that you have an obligation to reflect upon whether and how this insight can be used in practice and then bring your knowledge into play. You must keep your eyes open to practical problems and try to develop the skills required to solve these problems." Arge sees a natural interplay between basic research and practical applications. In fact, this neatly summarizes his view of research in general.

"Our competitive advantage is that we have based our business on original and groundbreaking basic research. We are more than 'just' good at what we do. We have made research breakthroughs and translated our knowledge into practice," he continues.

"It is extremely satisfying to see our knowledge translated into something practical," Arge concludes. "In many branches of science, it takes a long time before you are sure that the basic research breakthroughs you have achieved will also bring about change. Here the road from realization to market is much shorter."



FACTS:

Center for Massive Data Algorithmics (MADALGO)
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www.madalgo.au.dk