MODELLING AND CONTROL OF COVID-19 IN A BANK ENVIRONMENT

CHALLENGES: Health, demographic change and well-being

PRODUCTIVE SECTOR: Risk management, Healthcare

PROBLEM DESCRIPTION

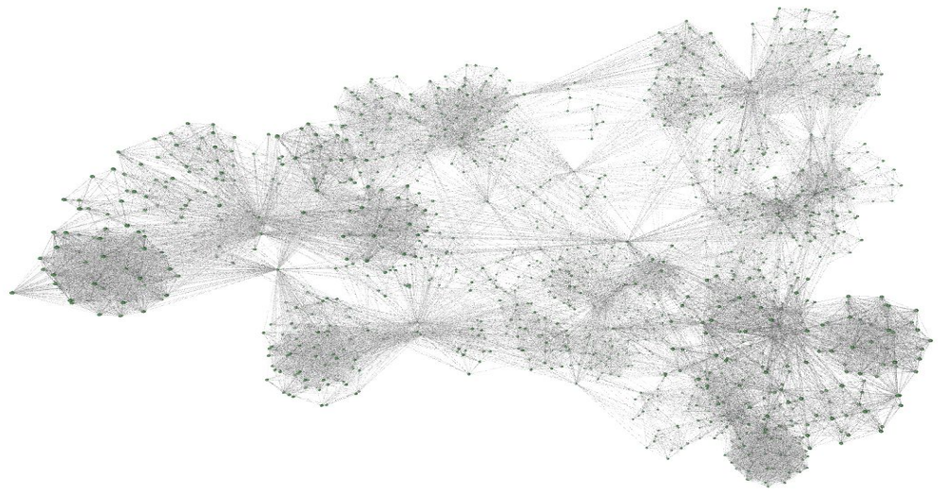
The intra-company spread of COVID-19 can be mitigated using numerous restrictive measures, all carrying an inevitable cost for any business. Hence, they must be well-justified from a risk-management standpoint so that they are seen as a reasonable compromise from other management perspectives with conflicting interests.

CHALLENGES AND GOALS

Evaluate the efficacy, justify the usage, and assess possible improvement of protective measures aimed at mitigating intra-company transmission using large-scale modeling on the company's connection network.

MATHEMATICAL AND COMPUTATIONAL METHODS

The connection network of employees was constructed based on data analytics provided by the industrial partner. Daily environmental COVID-19 incidence was reconstructed from mortality data in order to drive infections originating from outside the connection network. The disease spread was modeled using a custom-tailored temporal Gillespie method realized over the EoN module in Python. Vertex centrality analysis was carried out for various centrality measures using CINNA package in R.



Typical component of a real-life connection network

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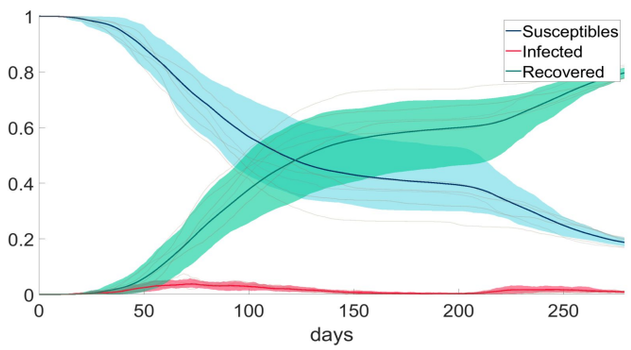
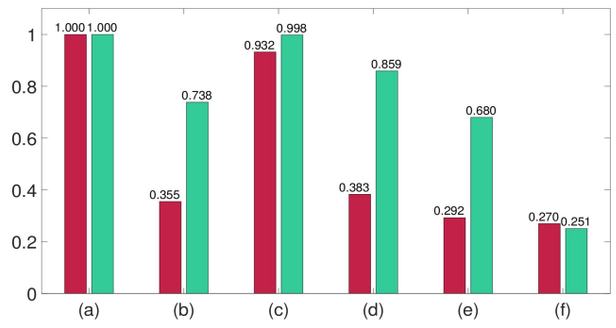
Results and Benefits

The results of the project demonstrate the efficacy and necessity of the control measures introduced by the industrial partner, and provide an insight on how to mitigate disease transmission risk in both present (COVID-19) and future epidemic situations. The centrality analysis results in an improvement of the key measures that have been used in practice.



Transmission model for a single measure



Relative efficacy analysis of various measures

Custom-tailored temporal Gillespie method for large-scale disease transmission modeling and centrality analysis over real-life connection networks

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