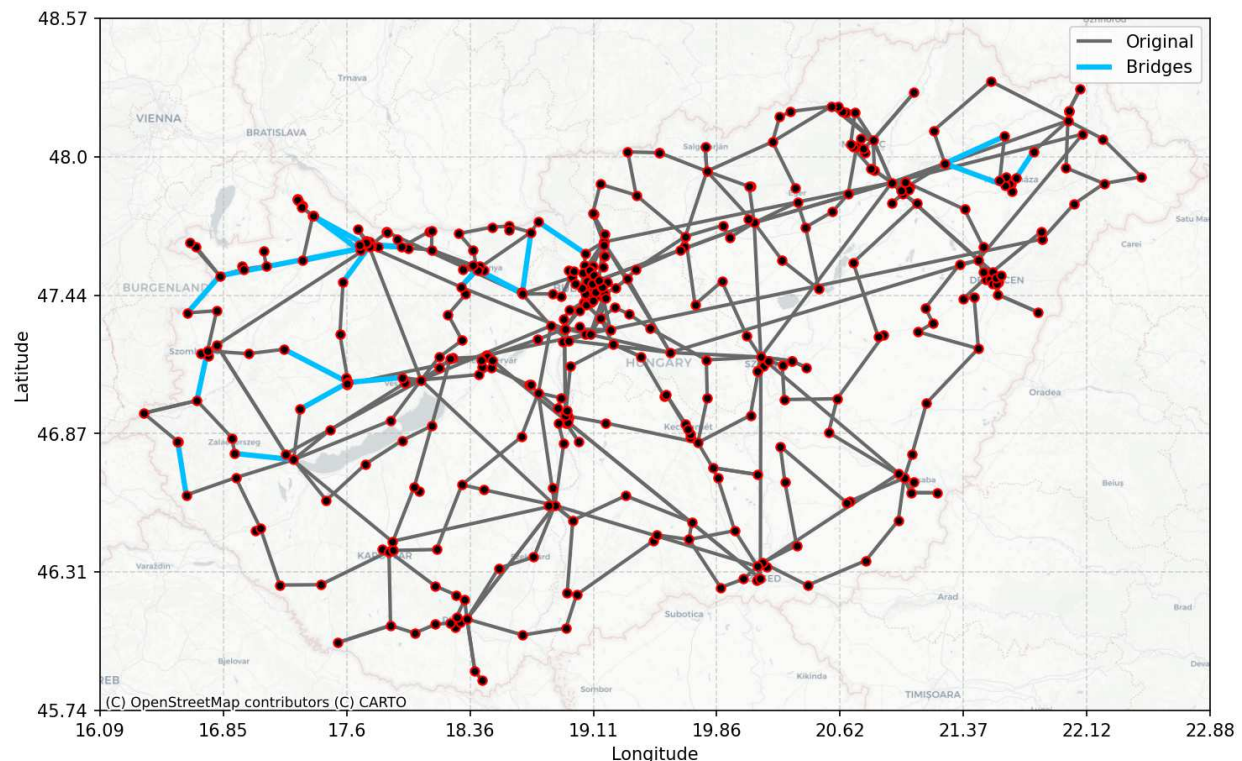


Quantitative comparison of power grid reinforcements

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Map of Hungary and the layout of the high voltage network, with edge weights depending on admittance and voltage. This case is the most realistic layout of the model. Black is the original network, and edges marked in blue are found "fixes" based on the location of bridges among communities.



The paper presents evaluation of three grid reinforcement strategies for Hungary's high-voltage power grid. The first method is adding connections among different grid communities. The second method is building bypass routes around weakly synchronized points. The third method is Fortifying edges identified as cascade triggering vulnerabilities. The study uses official operator data of grid models. The results show that duplicating community bridges is the most effective way to improve stability and prevent blackouts.

The researchers also observed that, in some cases, adding lines can make the grid less stable, showing signs of the phenomenon known as Braess' paradox.

Reference:

<https://www.sciencedirect.com/science/article/pii/S0378437125005722>