

# Prospectivity modeling

## XL3D Seminar 17th June 2020

Tero Niiranen

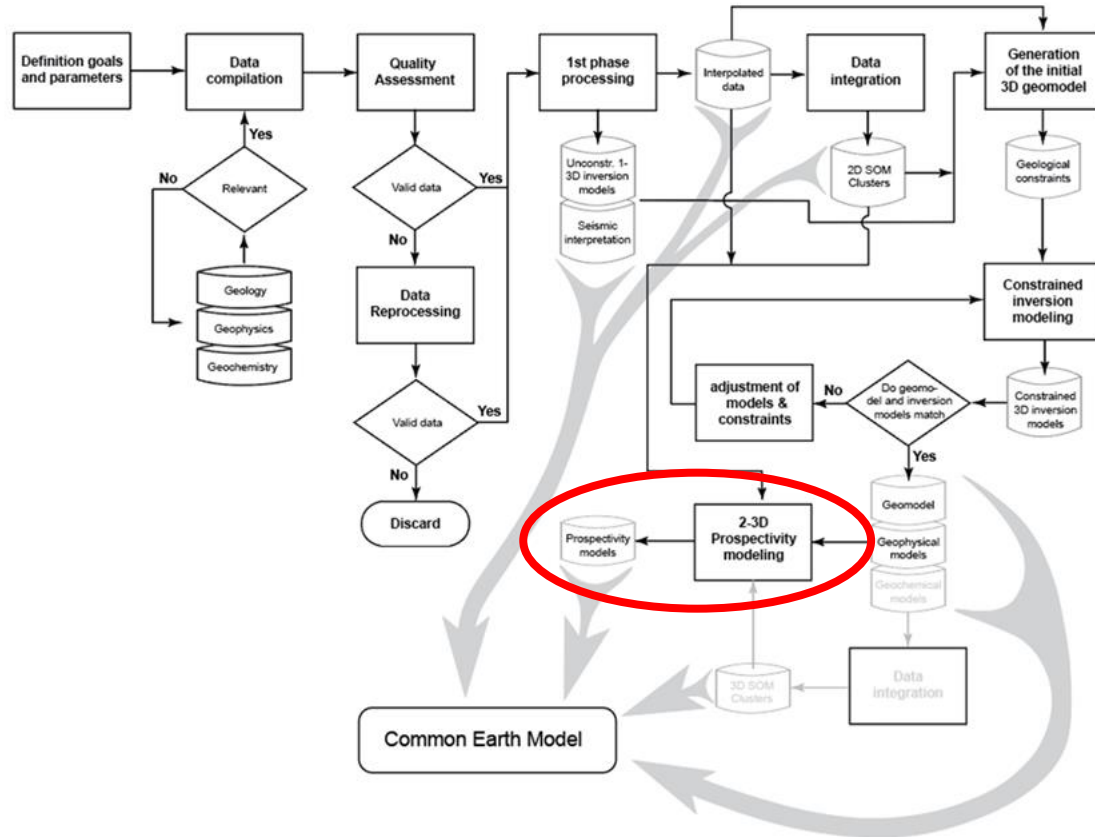


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# Prospectivity modeling



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# Prospectivity modeling methodology & workflow

- Dynamic loop and iteration
4. Validation
  3. Spatial analysis
  2. Input pattern generation – proxies for critical parameters
  1. Selection of the relevant data based on a mineral system model – critical parameters

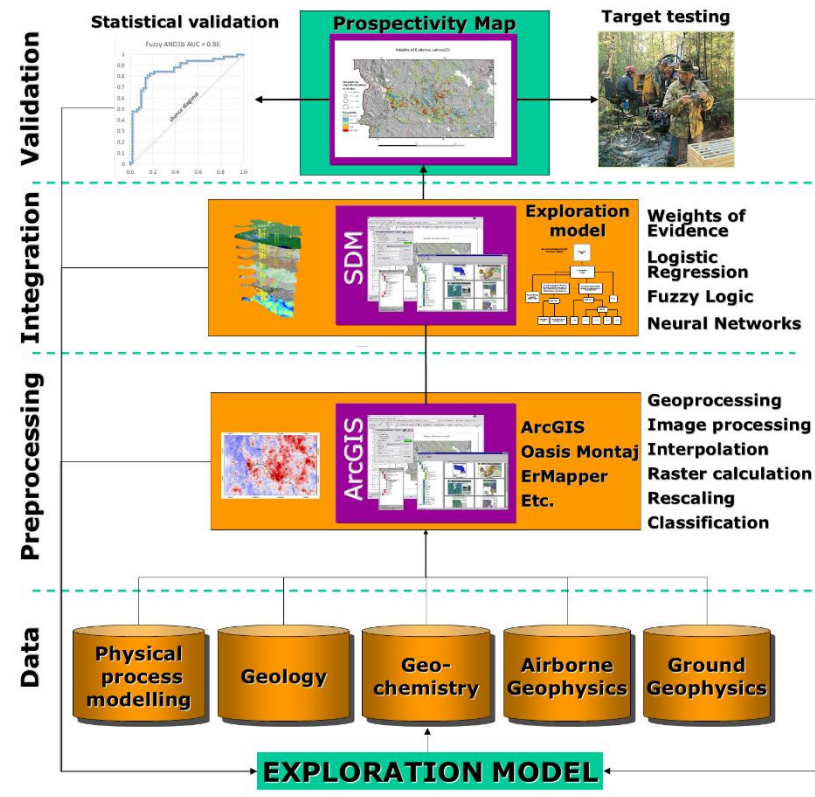
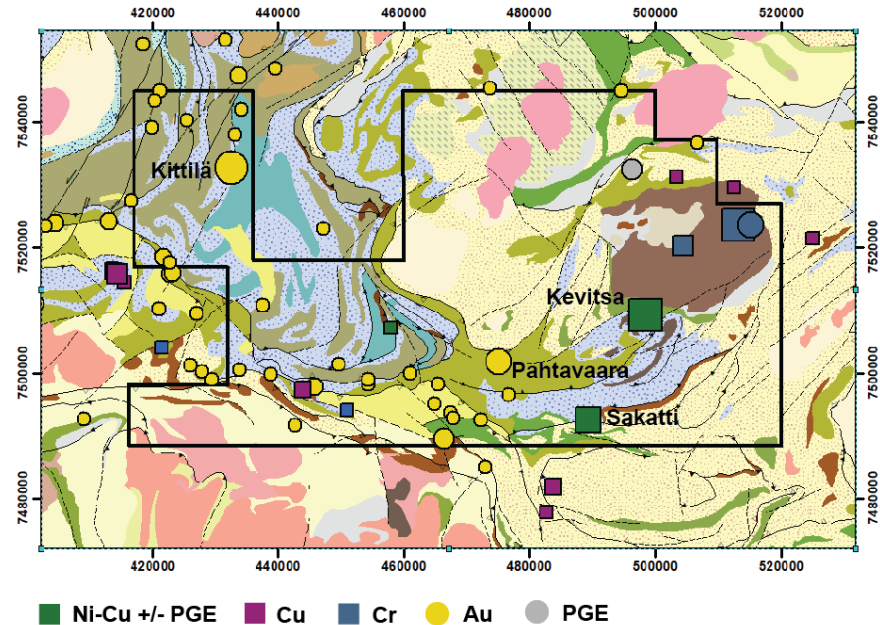
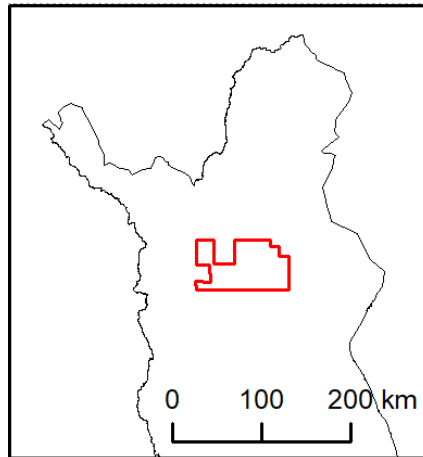


Figure Vesa Nykänen

# Study area & models



- Prospectivity models for two deposit types for which the study area is most potential: **Magmatic Ni-Cu and Orogenic Au**
- Knowledge-driven Fuzzy logic method used in both cases
- Data generated in the project implemented in the models

# Orogenic Au – data set

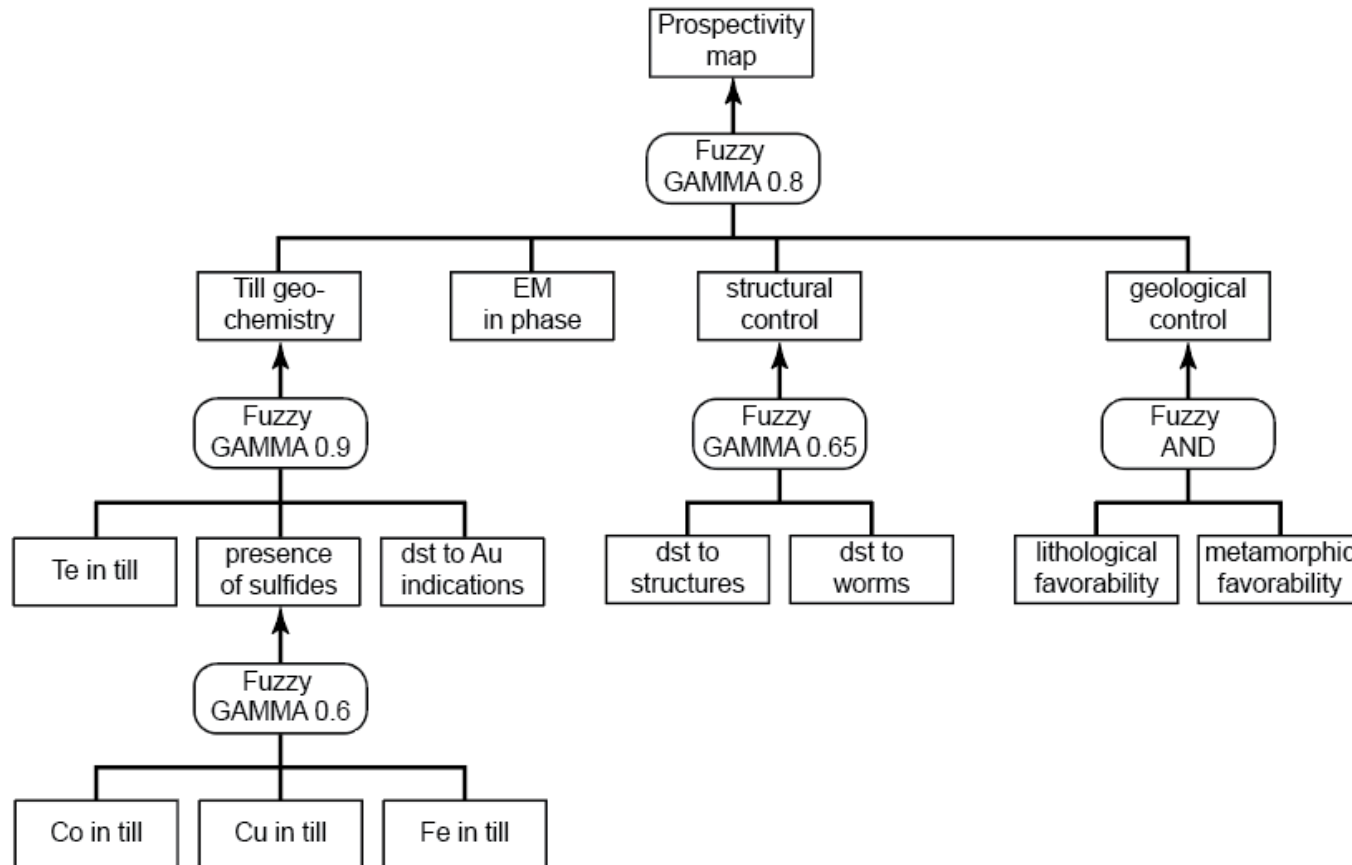
## Data sets used

- Regional till geochem. (Co, Cu, Fe, Te, Au)
- Bedrock map (lithology, metamorphism, structures)
  - Structural framework updated using XL3D modeling data
- Low altitude geophysics (EM real)
- Ground gravity (gravity worms)

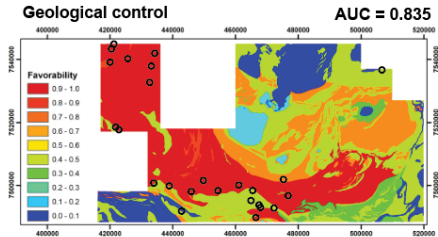
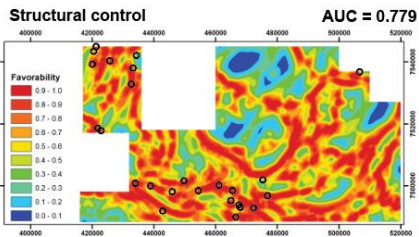
Receiver Operating characteristics (ROC) method used as model validation (known occurrences and deposits as validation points)



# Orogenic Au model:

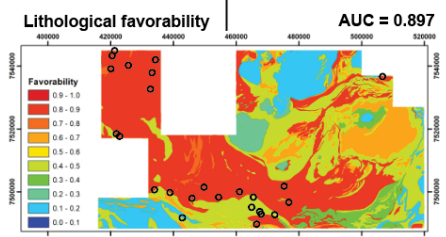
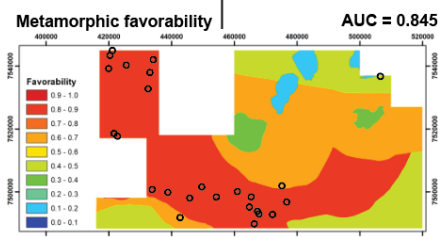
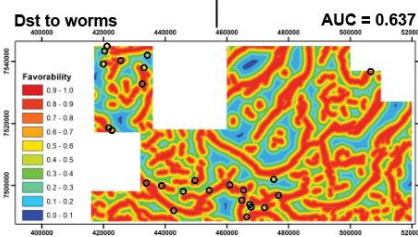
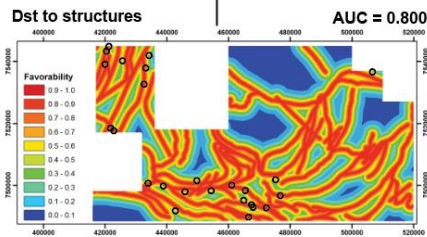


# Examples of intermediate prospectivity maps:



Fuzzy Gamma 0.65

Fuzzy AND



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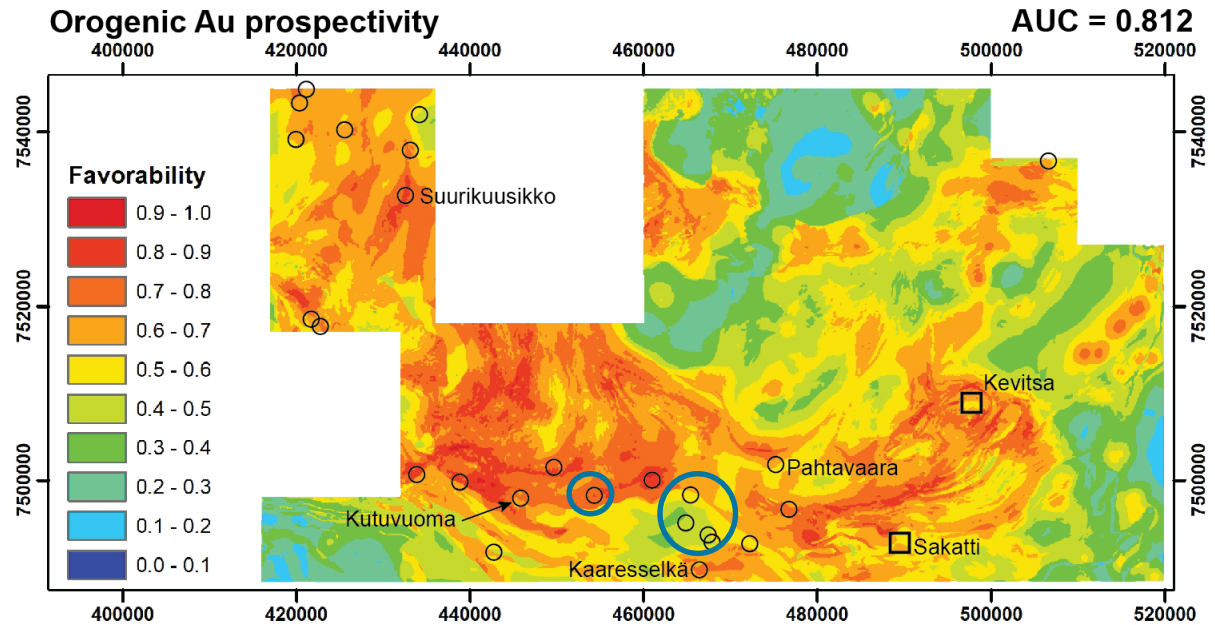
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# Orogenic Au prospectivity map

○ The most recent discoveries (2016-2020)



- Visually the model appear to predict known deposits relatively well with some exceptions
- ROC test yields AUC score of 0.812 indicating only moderately robust predictivity
- Relatively large percentage of the area in high to moderately high prospective categories -> adversely impacts to ROC test results



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# Magmatic Ni-Cu – data set

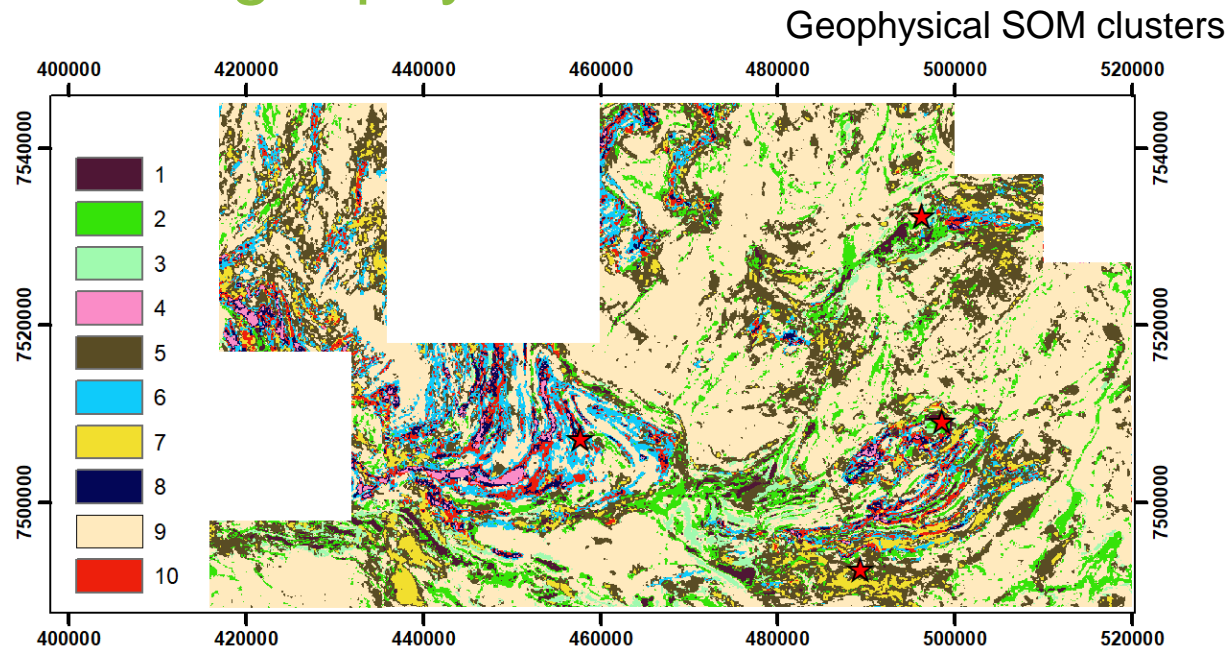
## Data sets used

- Regional till geochem. (Co, Cu, Ni, Pd)
- Bedrock map (lithology)
- XL3D 3D model structural data (conduits)
- Ore indications data base (Ni-Cu indications)
- SOM clusters and Q-error derived from geophysical data (gravity, magnetics, EM)

Due to very limited amount of know deposits and occurrences model could not be validated similarly to Orogenic Au case



# Clustered geophysics



- Magnetic, EM inphase, EM quadrature, Bougure were clustered (regional field was filtered from the potential field data)
- Categorical classification based on cluster properties & observed links to favorable lithologies



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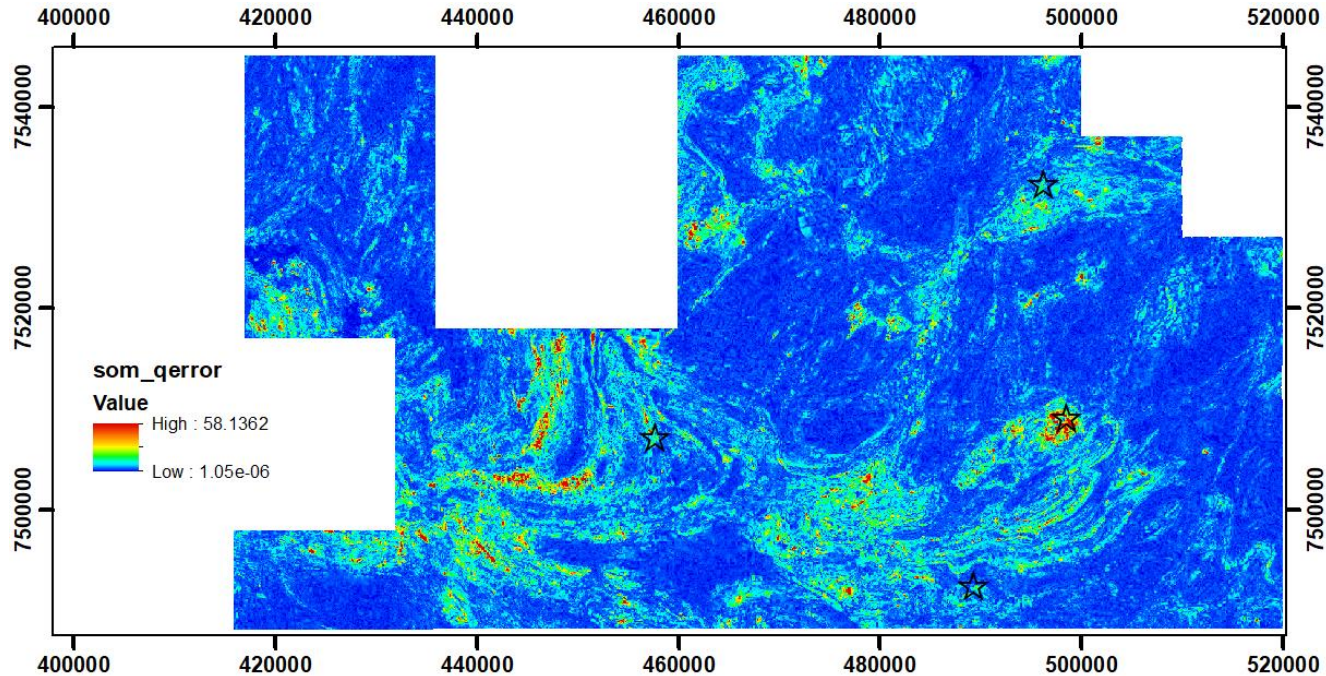
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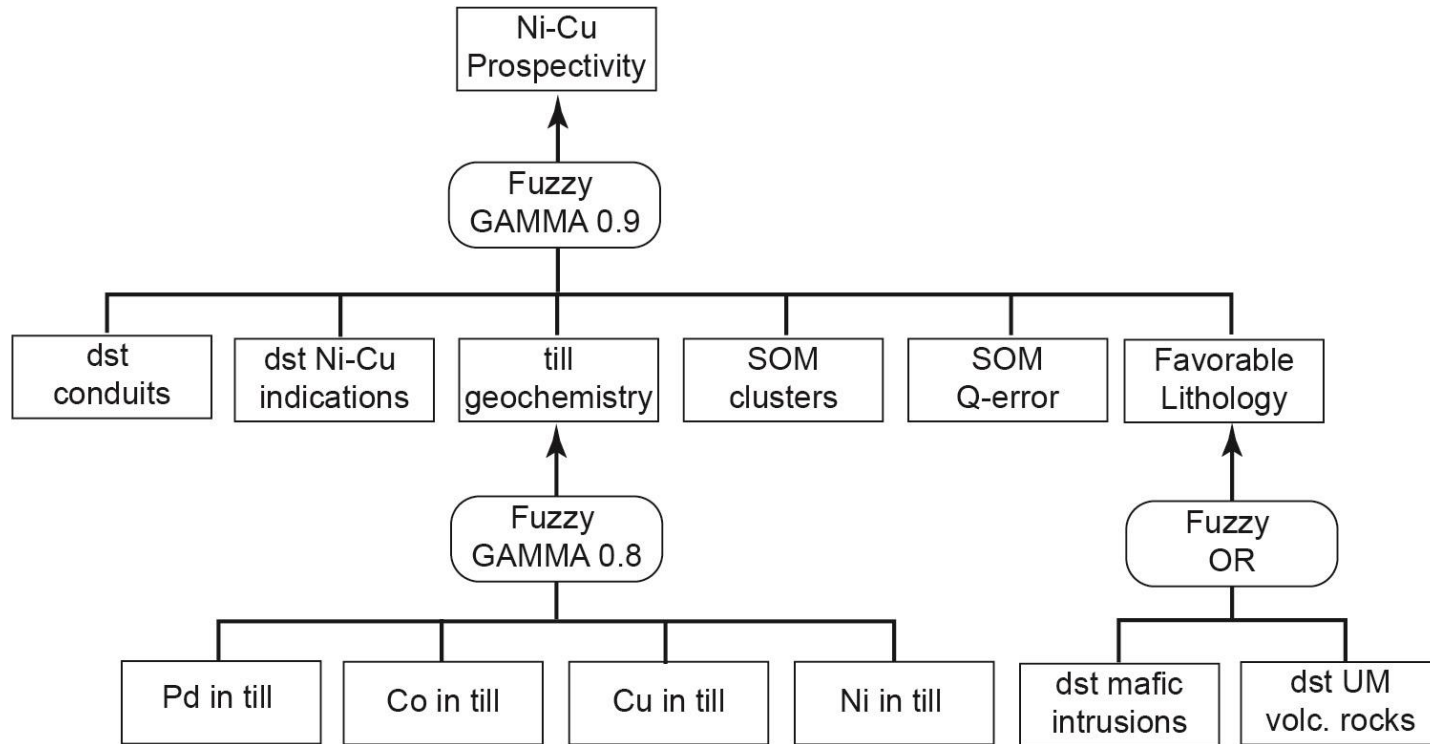
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# SOM Q-error

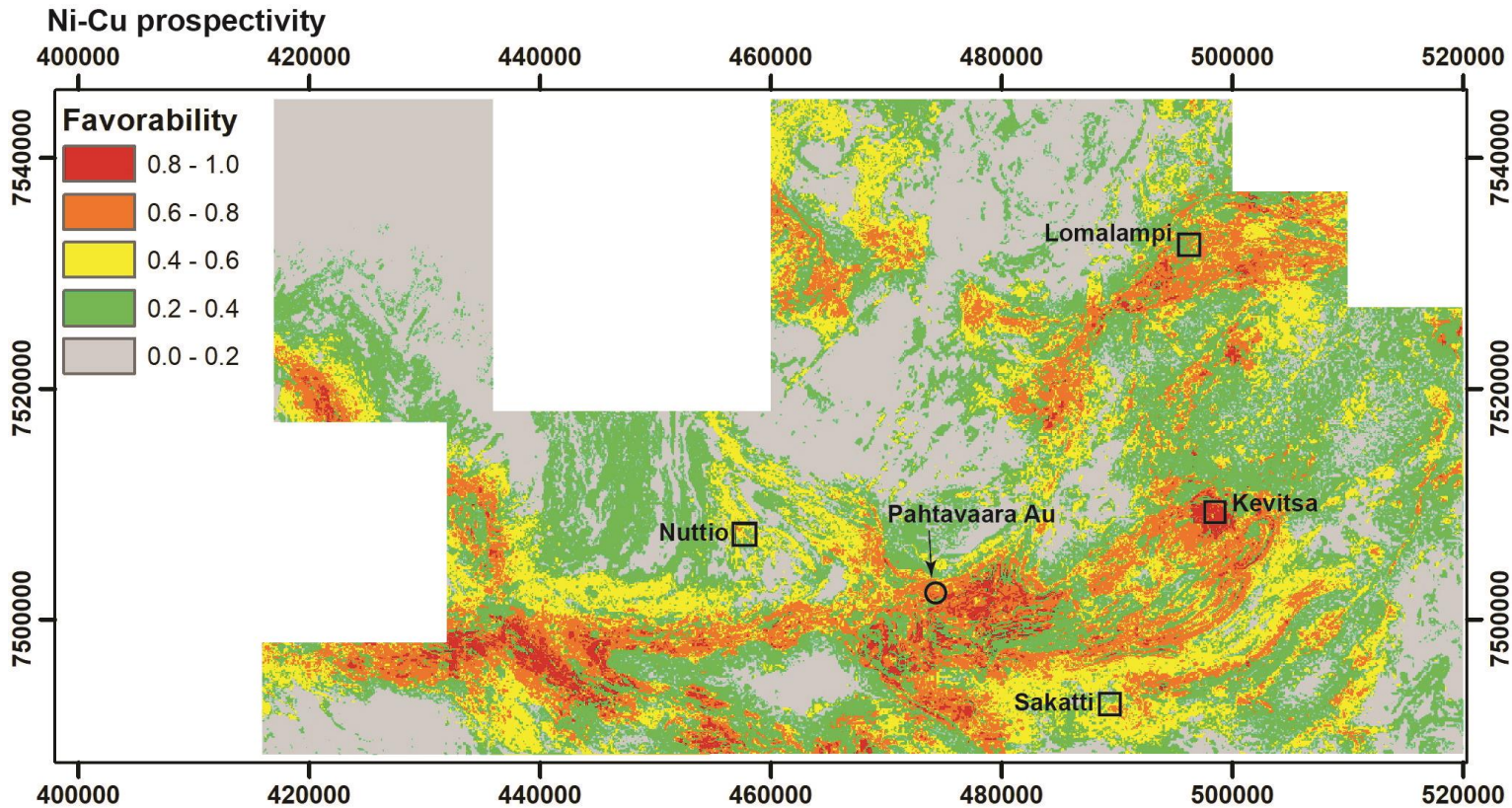


- SOM Q-error i.e. "abnormality" in data – used as proxy

# Magmatic Ni-Cu



# Ni-Cu prospectivity map



- Statistical validation not possible with as there are not enough validation points



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Thank You!



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