

ACCURATE HYBRID MACHINE LEARNING MODEL FOR LOCAL PV ENERGY YIELD PREDICTION

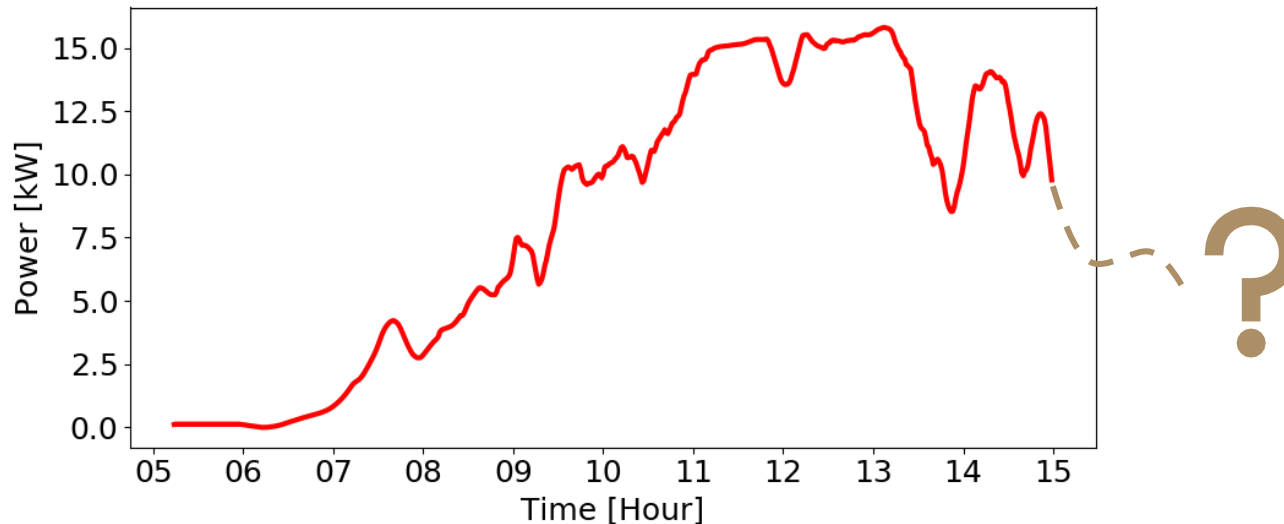
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**2020 SCCER-FURIES Annual Conference
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PV Energy Yield Predictions – Why?



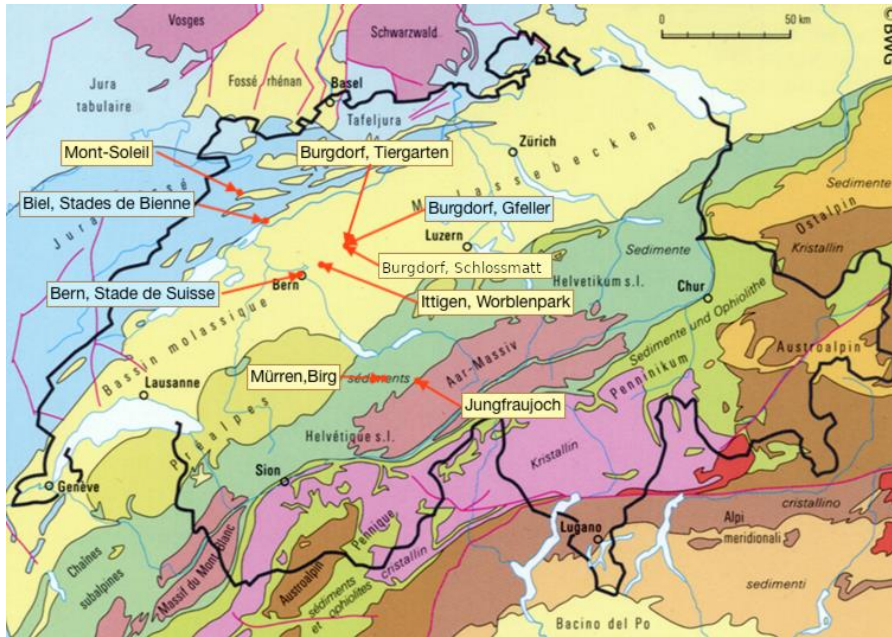
Aim: Enhance own production / consumption (esp. in winter)

➔ **higher and more stable profit for owners of PV installations**

Gain: Contributes to grid stability

Data Driven Approach for Machine Learning

1. Data



Source: BWG (Bundesamt für Wasser und Geologie)

AC-power

- 6 Swiss PV plants (3 urban, 3 alpine)
- 4 years (6/2016-6/2020)

Weather forecasts

- 6 months (1/2020-6/2020) (MeteoSuisse and Meteoblue)
- Global Horizontal Irradiation (GHI)
- Temperature, wind, humidity, pressure

2. Method

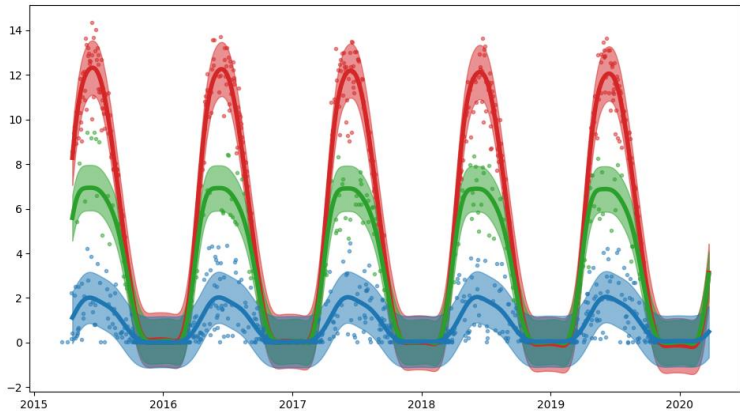
Step 1: Gauss Process model → basic behaviour of the PV plant

Step 2: Neural Network → adapts Gauss process according to weather condition

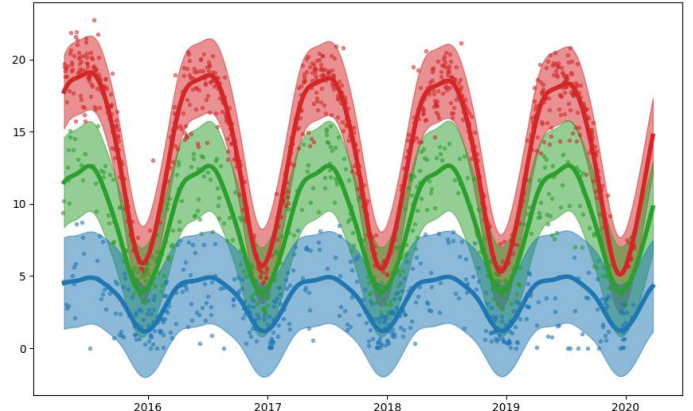
Input: Gauss Process model output and weather forecasts

Schematics of Method (2-Step Approach)

Step 1: Gauss Process per hour

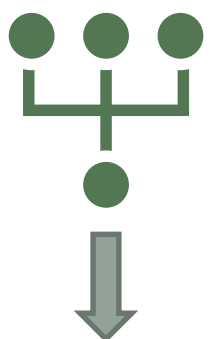


6:00 h

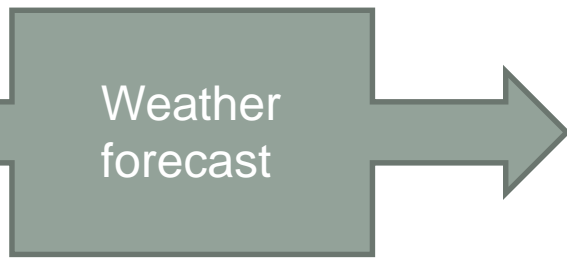


12:00 h

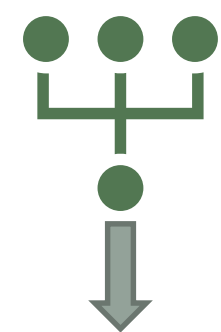
Step 2: Neural Network



AC power prediction for 6:00



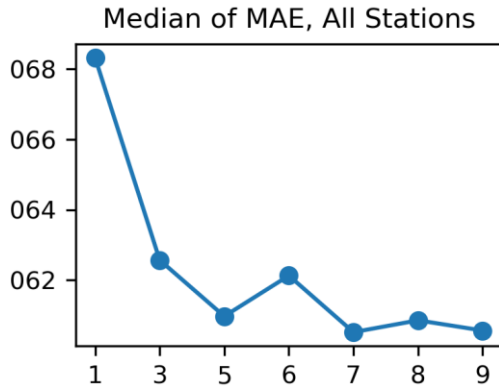
Step 2: Neural Network



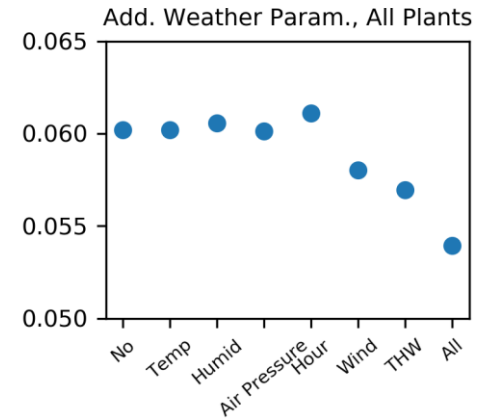
AC power prediction for 12:00

Results - Yield Predictions for 6 Swiss PV Plants

More than one GHI value per prediction



Additional weather parameters



Prediction precision increases > 30% with additional weather parameters

Plant	First Try	Optim.	Diff.	Increase %
Burgdorf Tiergarten	0.0662	0.0486	0.0176	36 %
Mont Soleil	0.0700	0.0513	0.0187	36 %
Worblenpark	0.0666	0.0456	0.0210	46 %
Jungfraujoch	0.0717	0.0535	0.0182	34 %
Birg	0.0807	0.0573	0.0234	41 %
Burgdorf, Schlossm.	0.0617	0.0472	0.0145	31 %

THANK YOU VERY MUCH FOR YOUR ATTENTION!

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