



Revolutionizing Biochar Production: AI-Driven Innovation

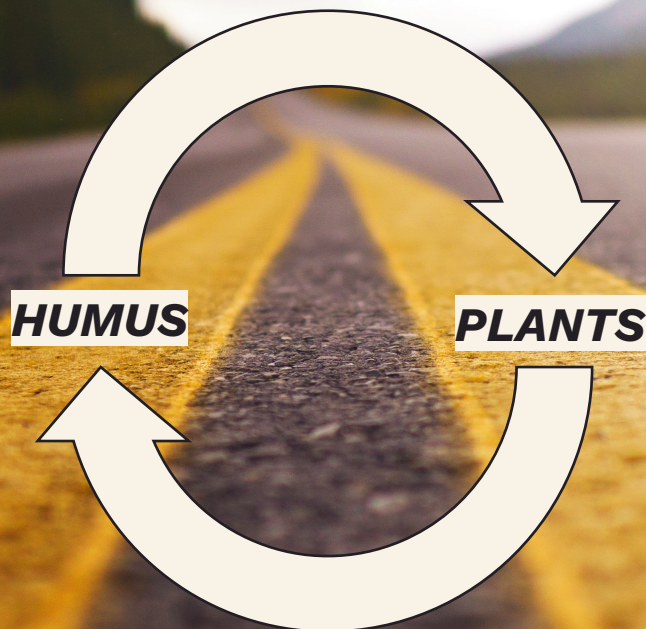
Tobias Schweitzer, AIRA Holding GmbH

FOURNEY

A silhouette of a person with a suitcase standing in a doorway looking out at a sunset over a rural landscape. The person is seen from behind, standing in the threshold of a doorway. They are holding a dark suitcase. The scene outside is a vast, open landscape under a dramatic sky with a sunset or sunrise. The sun is low on the horizon, casting a warm glow over the clouds and the landscape. The sky is filled with soft, colorful clouds in shades of orange, yellow, and blue. The ground is a mix of gravel and grass. In the distance, there are some buildings and trees. The overall mood is contemplative and hopeful.

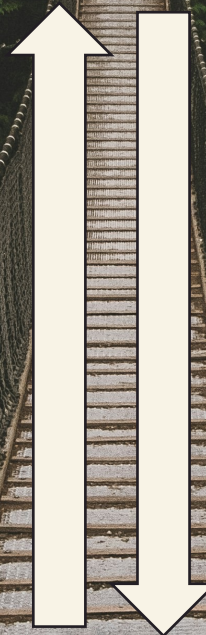
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SIMPLE



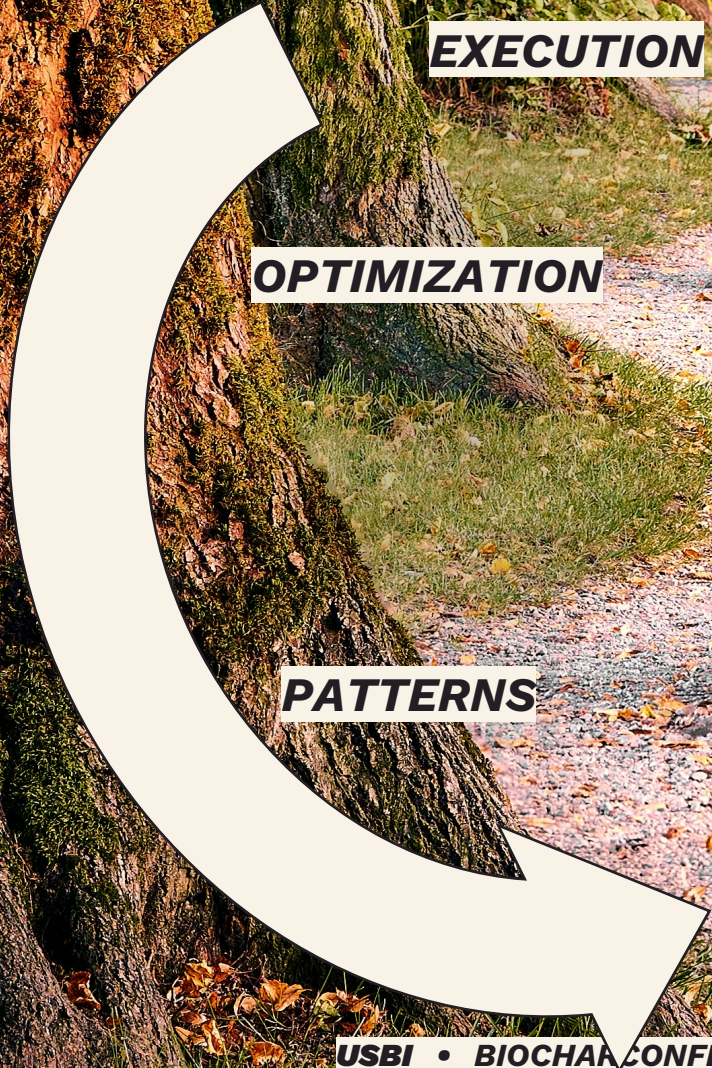
TRANSITION

PLATFORM-
PLANTS



DATA-
HUMUS

ARTIFICIAL INTELLIGENCE



EXECUTION

NEW STATE

OPTIMIZATION

PREDICTIONS

PATTERNS

**DATA-
HUMUS**

REVOLUTIONIZE BIOCHAR PRODUCTION

PREDICTIVE MAINTENANCE

QUALITY

EFFICIENCY

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FEEL IT?

NEW MARKETS

OLD MARKETS

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SUM UP

**DATA-
HUMUS**

ECOSYSTEM

**BETTER
PREDICTIONS**

**HIGH
TECH**

**MIN.
DOWNTIMES**

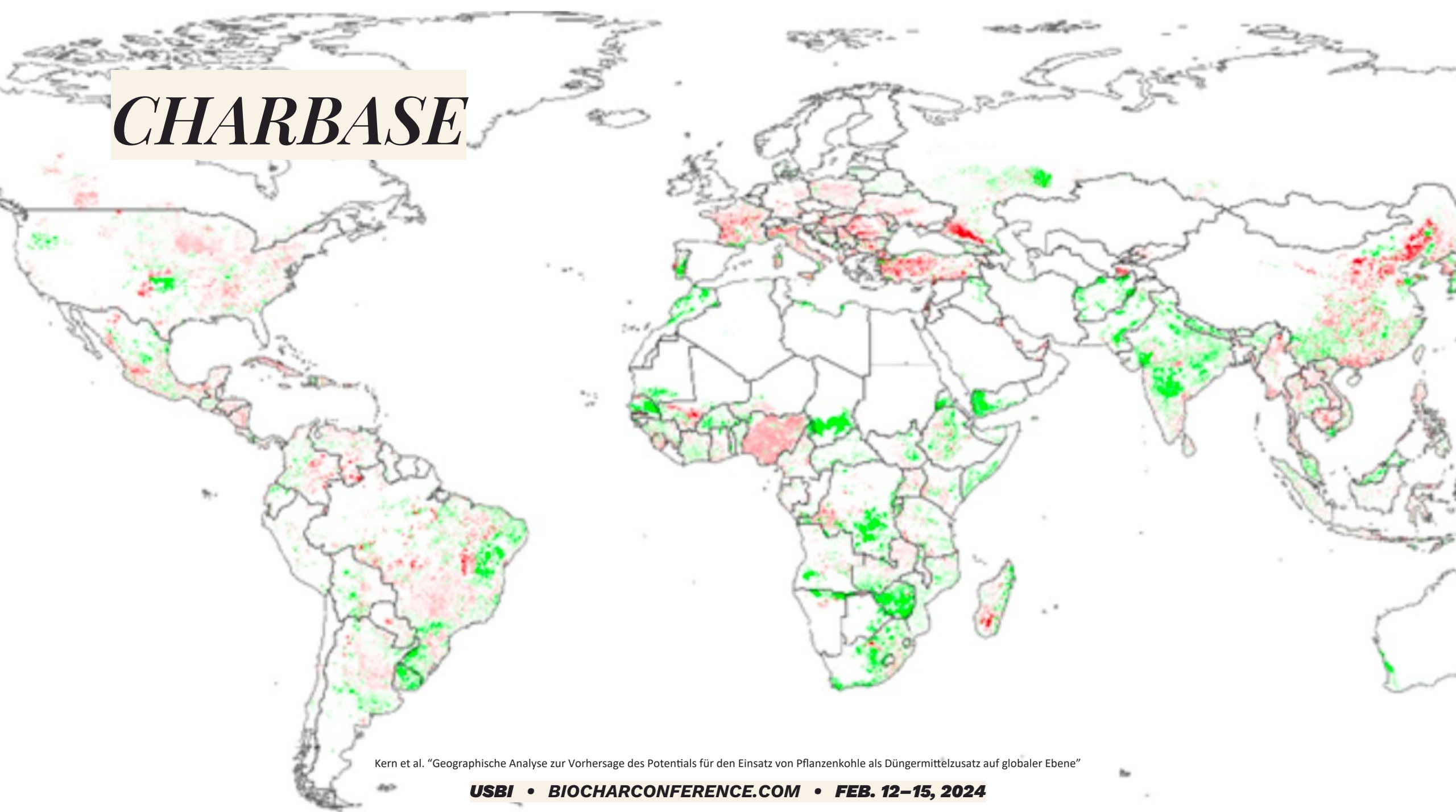
**MAX.
EFFICIENCY**

**HIGH
QUALITY**

MORE DATA

**PLATFORM-
PLANTS**

CHARBASE



Kern et al. "Geographische Analyse zur Vorhersage des Potentials für den Einsatz von Pflanzenkohle als Düngemittelzusatz auf globaler Ebene"

Biochar in agriculture – A systematic review of 26 global meta-analyses

Hans-Peter Schmidt¹  | Claudia Kammann² | Nikolas Hagemann^{3,4} |
Jens Leifeld⁴  | Thomas D. Bucheli⁴ | Miguel Angel Sánchez Monedero⁵ |
Maria Luz Cayuela⁵ 

¹Ithaka Institute, Arbaz, Switzerland

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Hochschule Geisenheim University,
Geisenheim, Germany

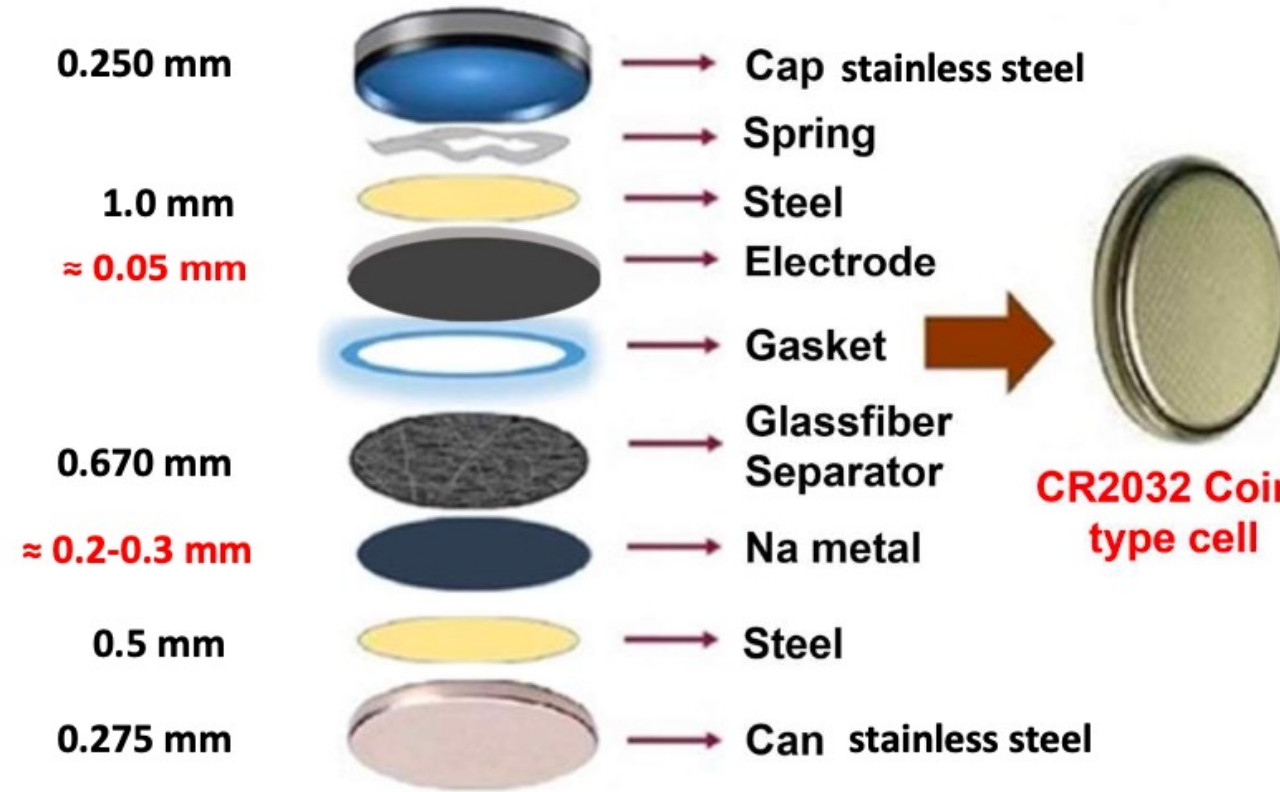
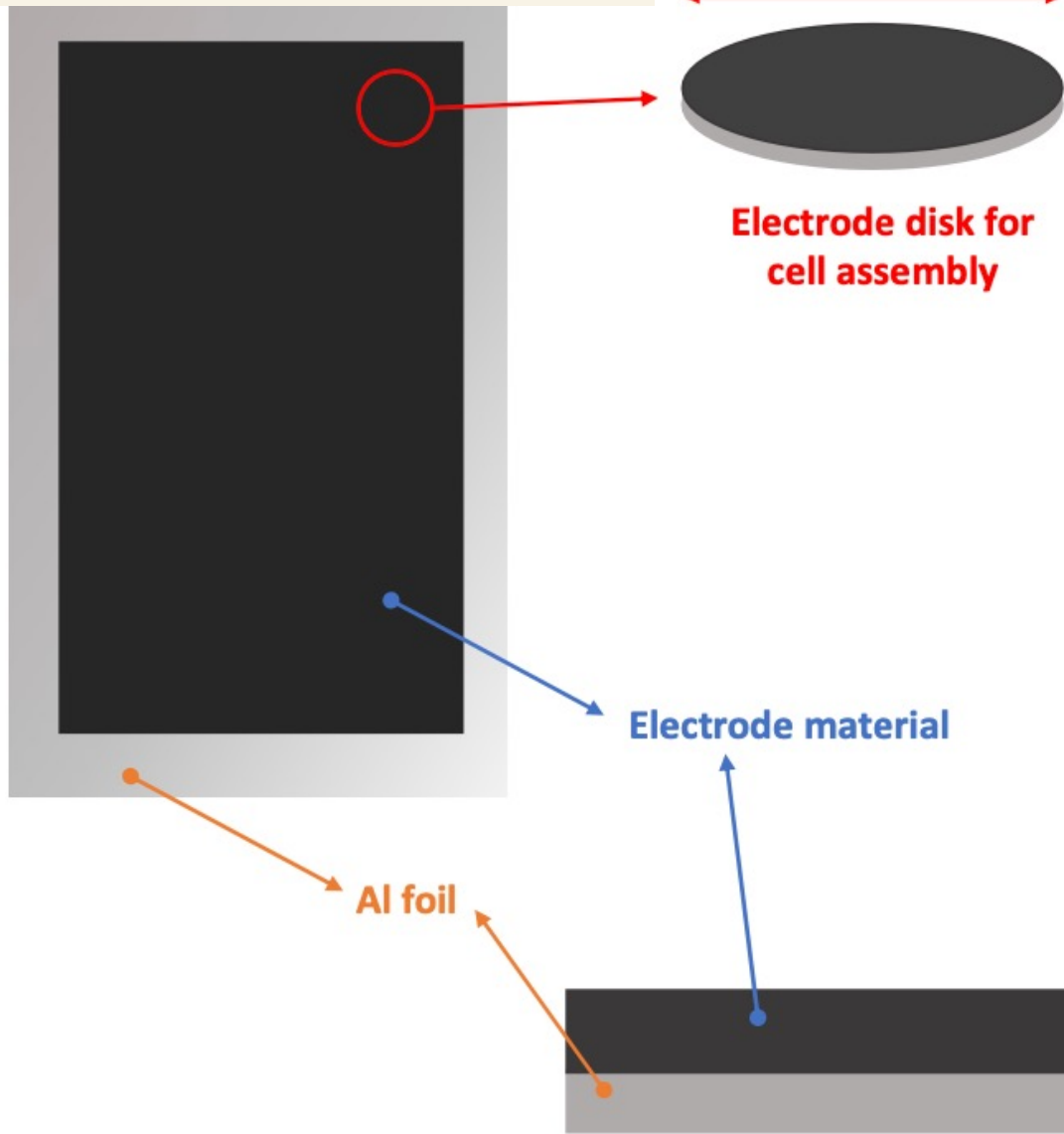
³Ithaka Institute, Freiburg, Germany

⁴Agroscope Zürich Switzerland

Abstract

Biochar is obtained by pyrolyzing biomass and is, by definition, applied in a way that avoids its rapid oxidation to CO₂. Its use in agriculture includes animal feed-
USBI • BIOCHARCONFERENCE.COM • FEB. 12–15, 2024dding, composting, storage or an-

BIOCHARGE



EMISSION TECH

Feedback

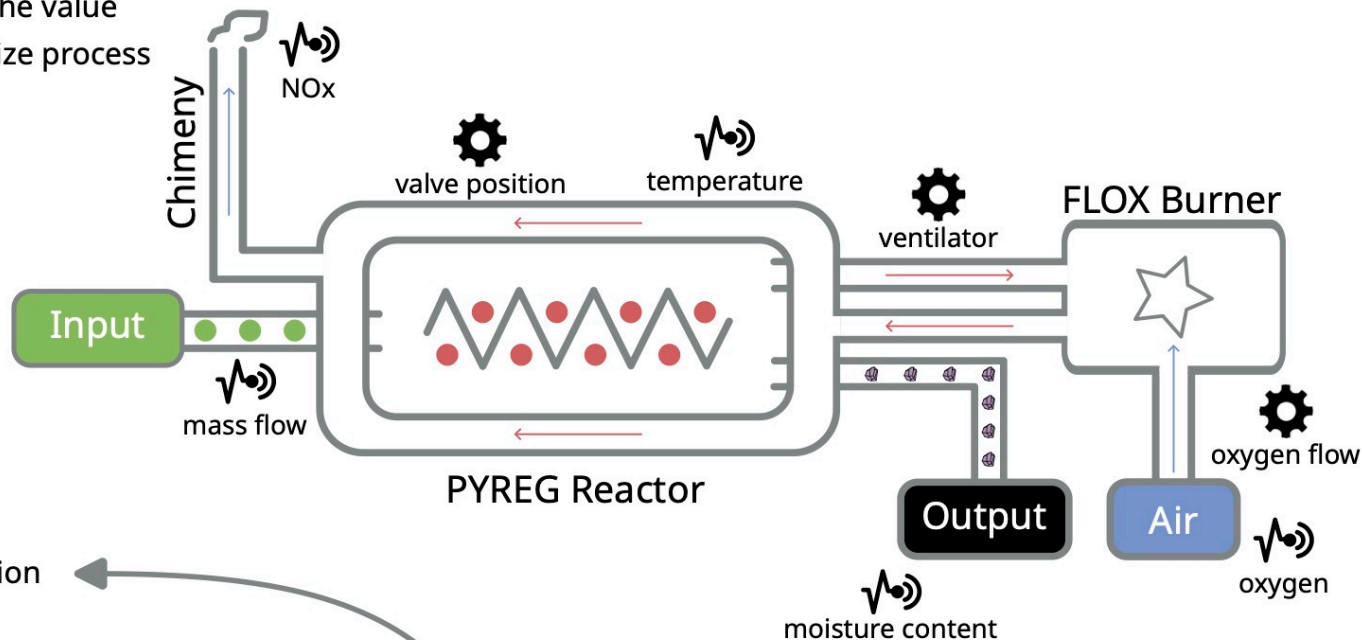
- Display recommended values on machine
- Operator can **accept** or **reject** the value
- Use **human feedback** to optimize process

Data collection

- Log **sensor** and machine status
- Store data in the **cloud**
- Use **feedback** data

Data Preparation

- **Calibrate** sensor data
- **Outlier** detection
- Sensor data as model input
- Machine status as **target**

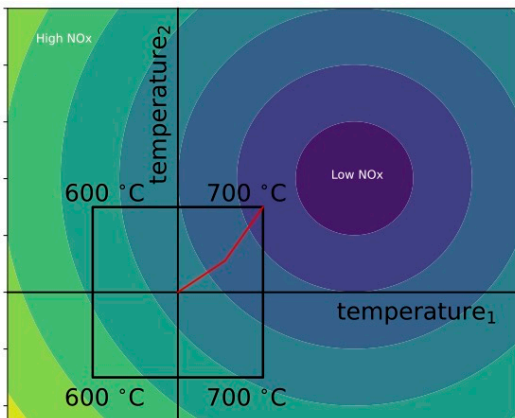


Constrained Optimization

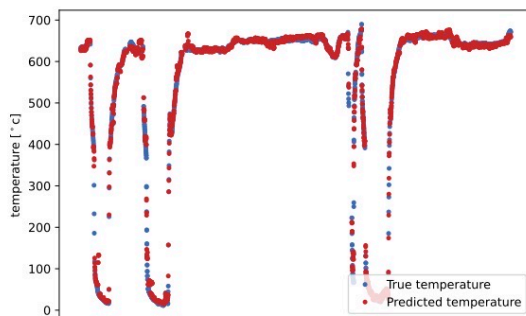
- Use model to **predict** NOx value
- **Constrain** search space for the optimization
- Change machine state to **minimize** NOx

Model training

- Train **machine learning**
- "**Re-build**" machine

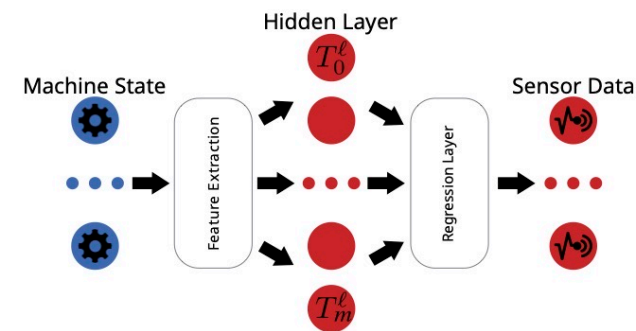


Model evaluation

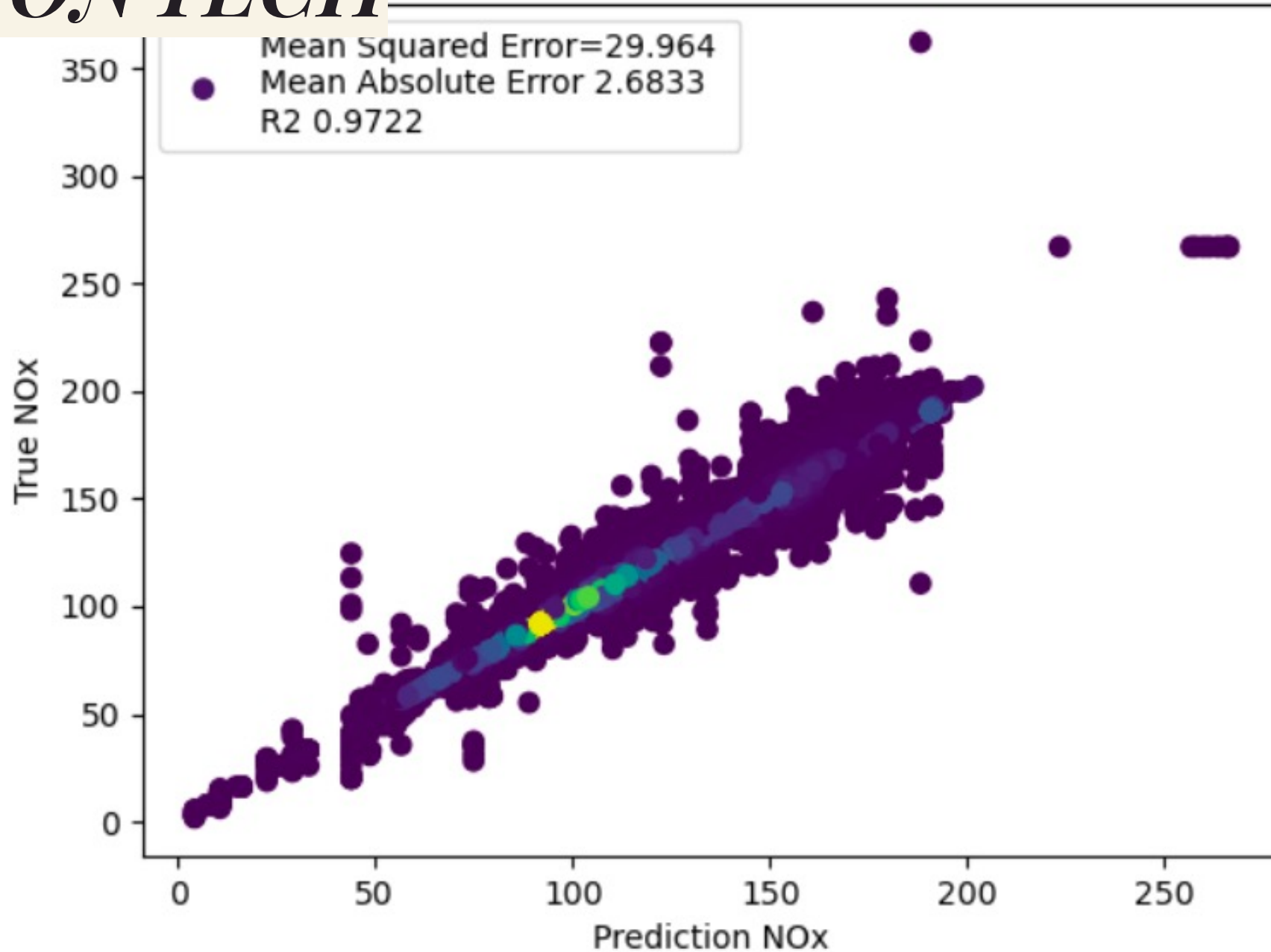


Source:

https://figshare.com/articles/poster/Reducing_NOx_Emissions_in_Pyrolysis_Machines_for_Biochar_Production_A_machine_learning_approach/23772729/1



EMISSION TECH



EMISSION TECH

Feedback

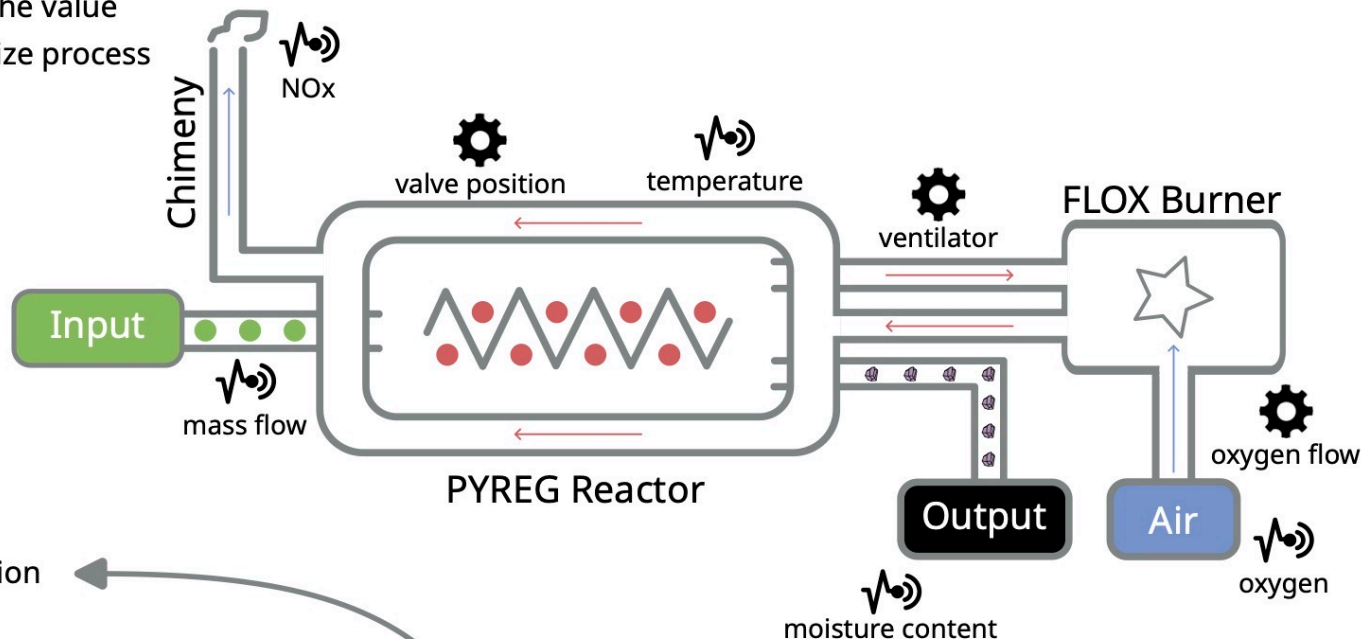
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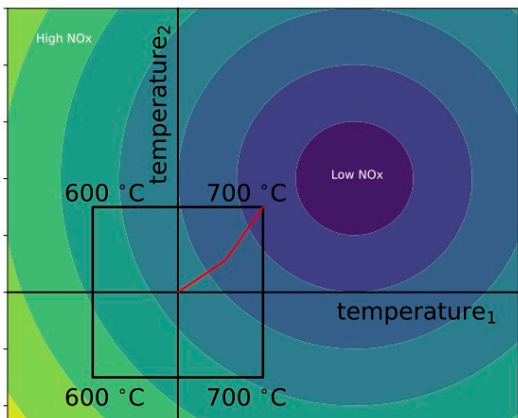


Constrained Optimization

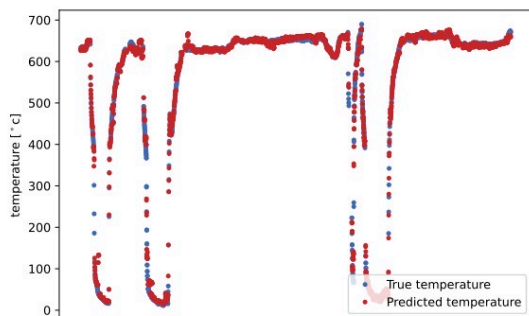
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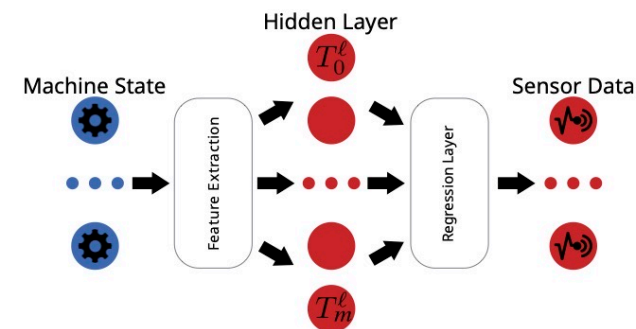


Model evaluation



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VISION

UNKOWN

BIOCHARGE

CHARBASE

EMISSIONTECH

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ABOUT AIRA HOLDING GMBH

AIRA

ARTIFICIAL INTELLIGENCE

RESEARCH AND ANALYTICS

**WE CREATE FAIR AND
REGENERATIVE ECOSYSTEMS**

**COOPERATIVE BUSINESS MODEL
FEDERATED LEARNING APPROACH**

STAY CONNECTED – THANK YOU!



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