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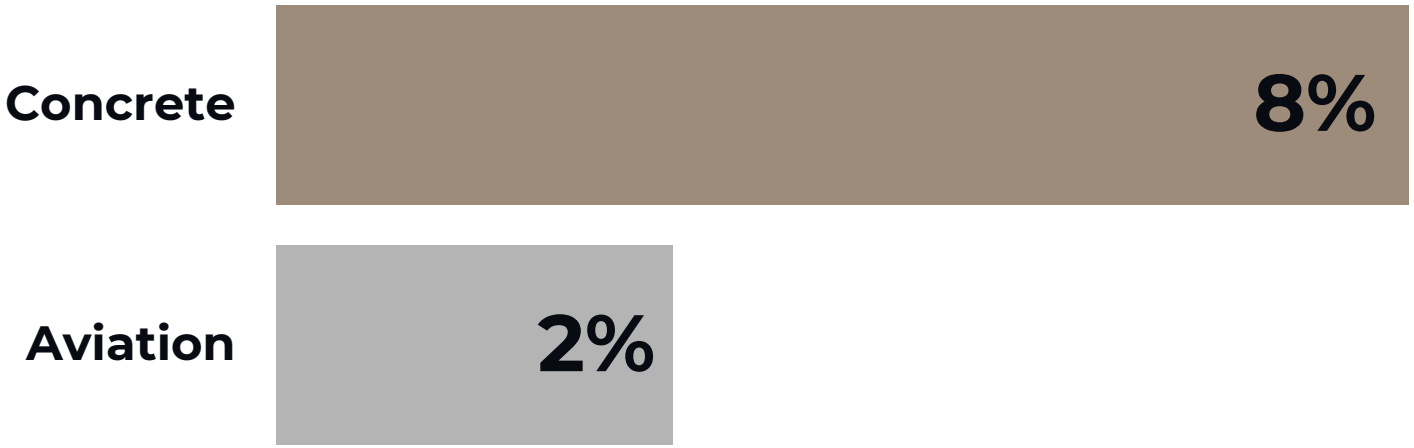
concrete.ai
From Lab to Field:
Using AI to Decarbonize Concrete at Scale

Concrete Carbon Footprint

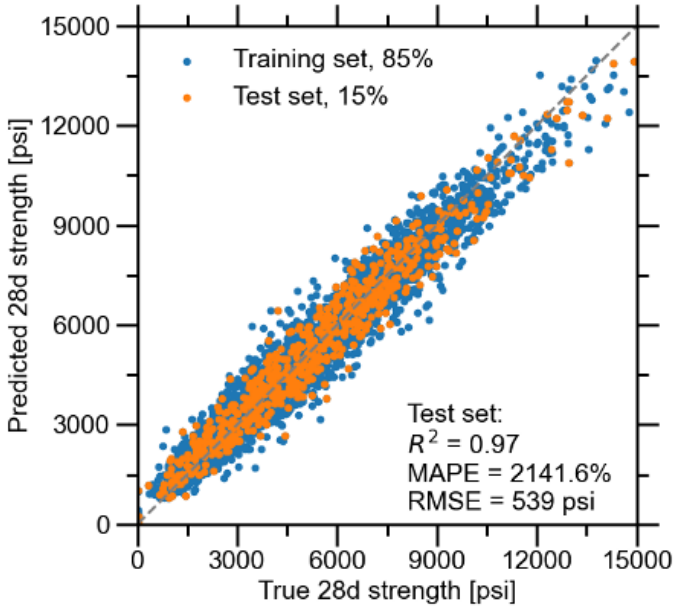
% of global CO_2 emissions



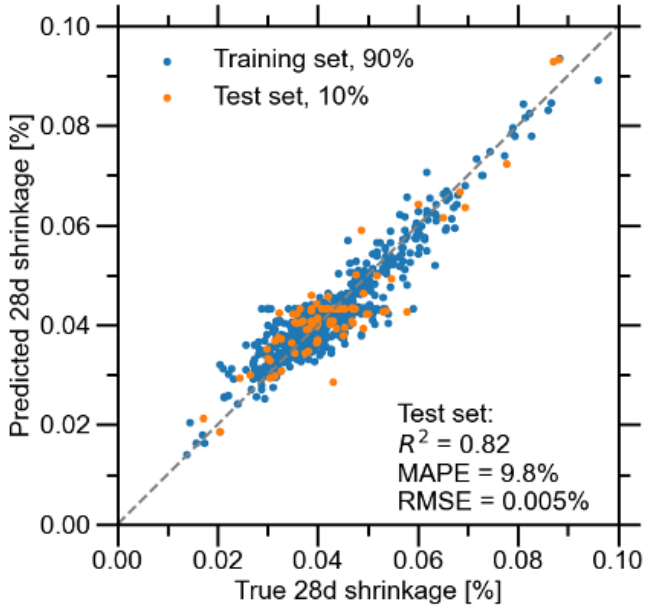
Machine Learning for Concrete Optimization

Traditional mix designs optimization is slow, laborious, and largely empirical.

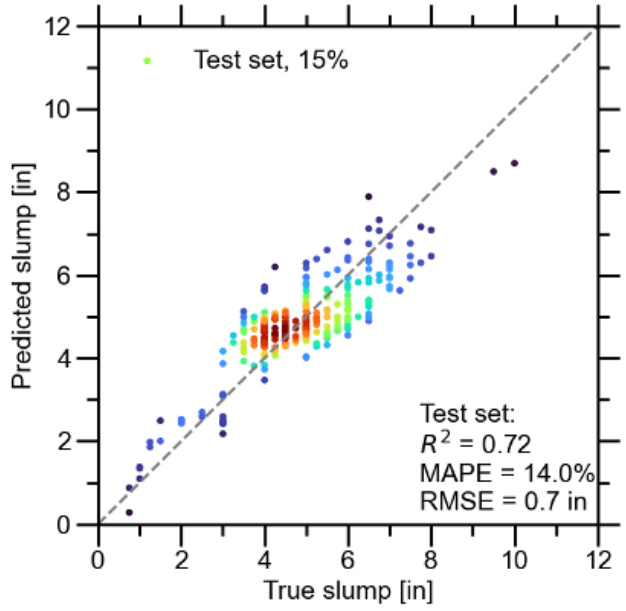
Machine learning can greatly accelerate mix designs optimization.



Compressive strength



Shrinkage

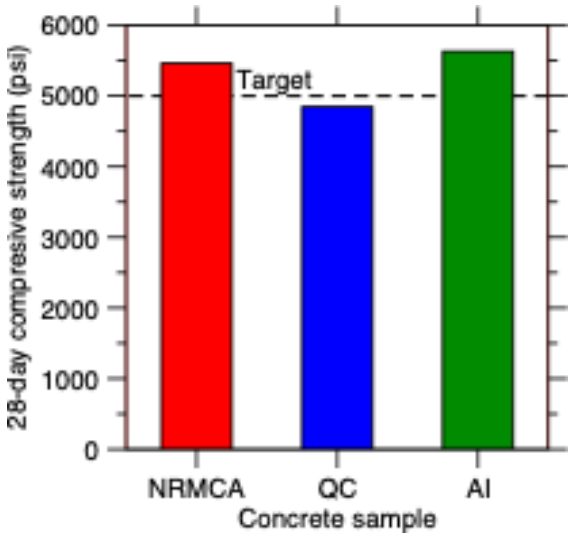


Slump

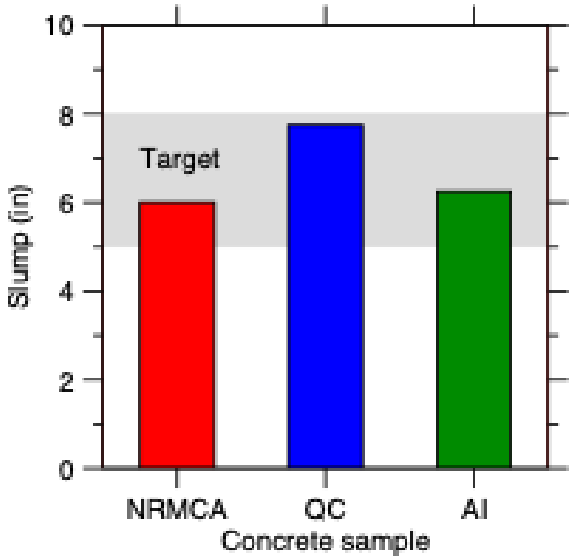
Human vs. AI Competition

Goal: Designing the most economical mix design showing a 5000 psi strength

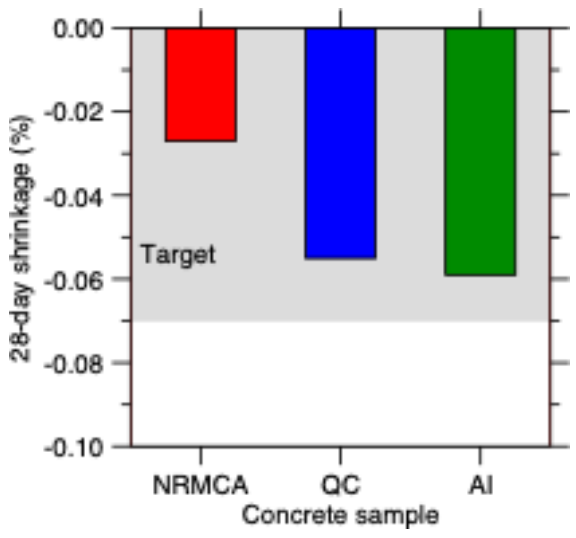
Using only materials available at the plant



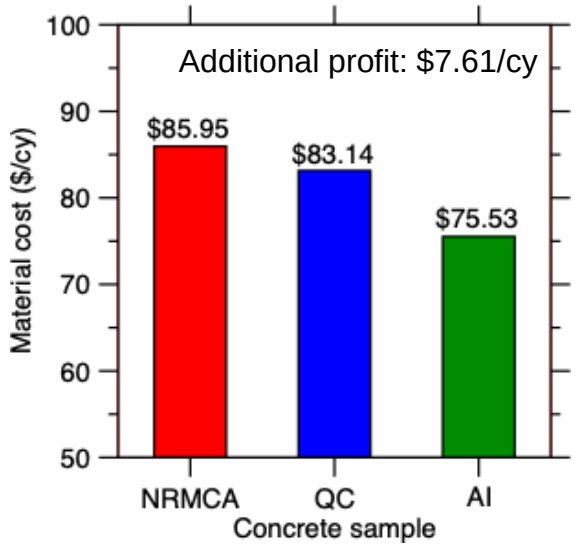
Target strength met



Target slump achieved



Maximum shrinkage satisfied



Materials cost decreased

Laboratory pilot

From Lab to Field

Challenges with concrete optimization at scale

Regionality of materials

The large variety of materials prevents one-fits-all approaches

Material variations over time

Materials physical and chemical properties can change over time (e.g., fly ashes)

Large number of mix designs

Concrete producers can have 1000s of mix designs in their catalogue

Manufacturing uncertainties

Concrete properties can be affected by the plant, transport time, temperature....

Hard-to-quantify properties

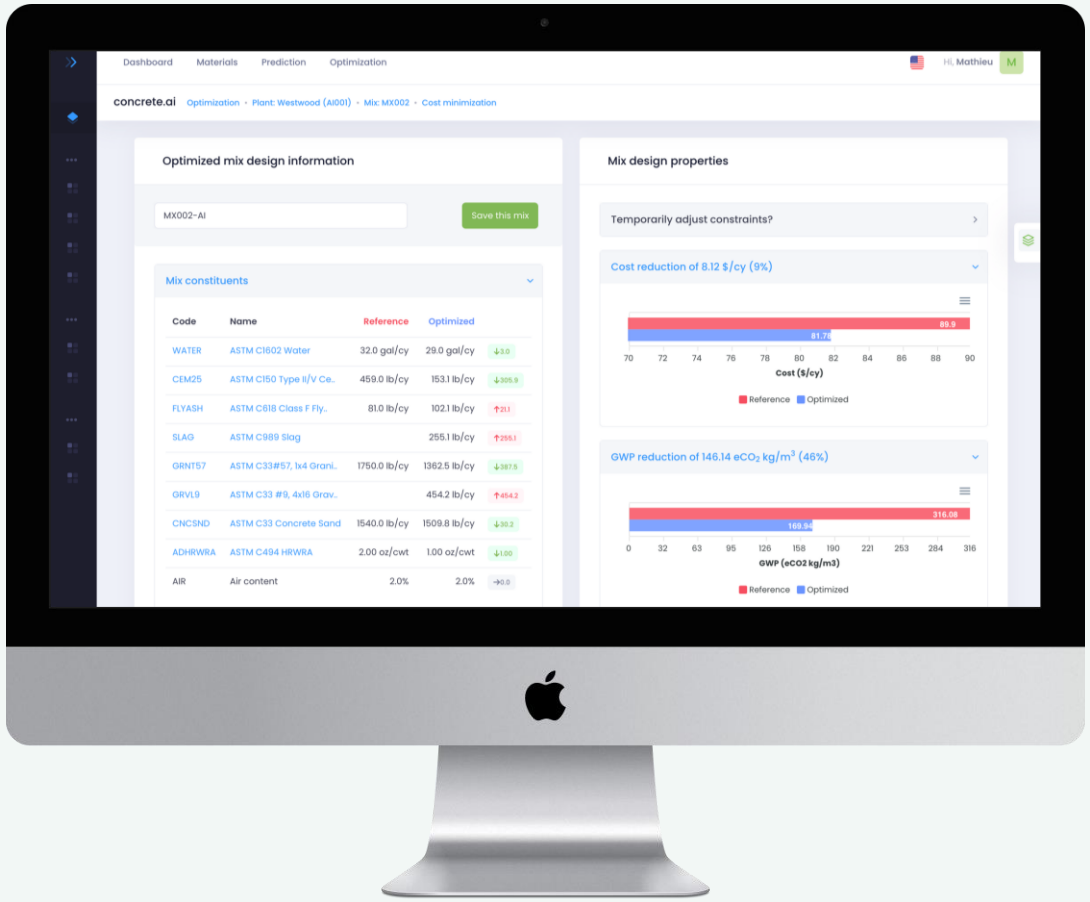
Some properties (e.g., finishability, pumpability, etc.) are challenging to quantify

Data availability

Test results data is not always accessible, organized, or numerous enough

Concrete.ai

Concrete.ai is a software that uses generative AI to reduce concrete's cost and carbon footprint



Concrete.ai Innovations

Optimizing concrete at scale

Large curated dataset

More than 1 million concrete datapoints, covering strength, slump, shrinkage, air content, pumpability, setting time, etc.

Patented optimization engine

Our patented generative AI pipeline enables high-throughput mix designs optimization

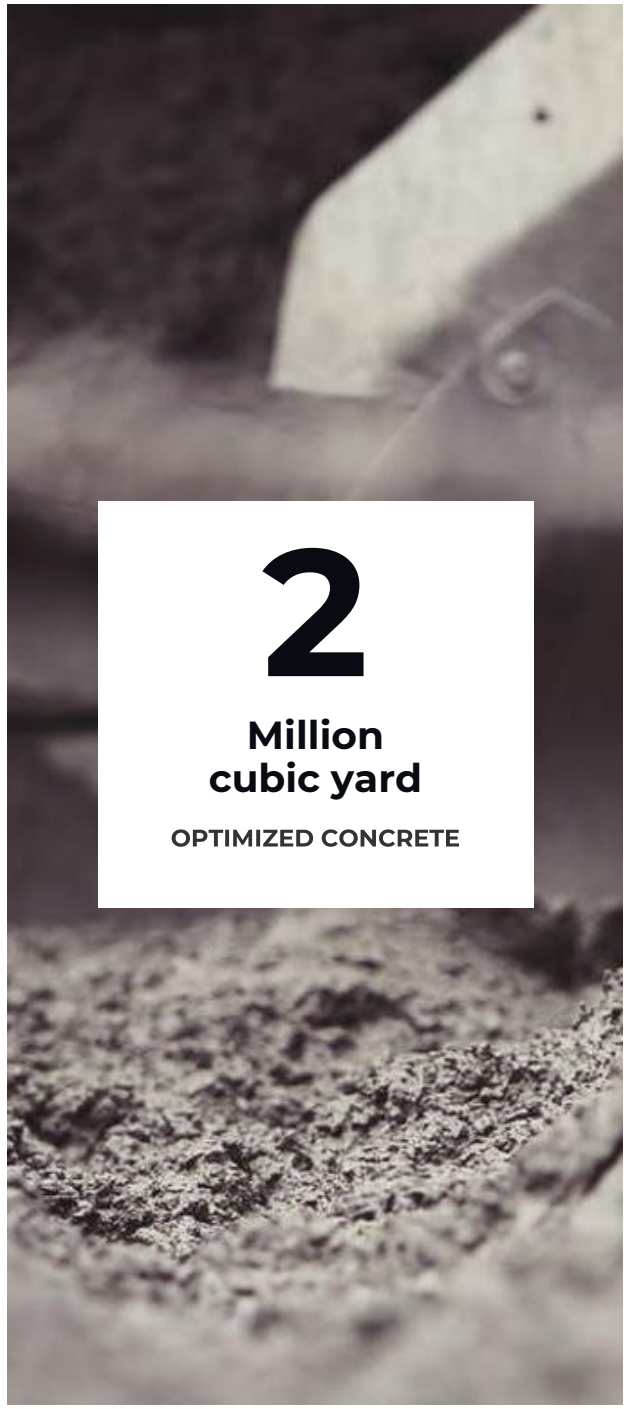
Partners across North America

Conducted projects in California, Utah, Illinois, Virginia, Canada, etc., with very different SCM availability

Native software integrations

Direct integration with industry-leading quality-control (QC) and batching softwares

Recognized with the 2023 NRCMA Innovation Award



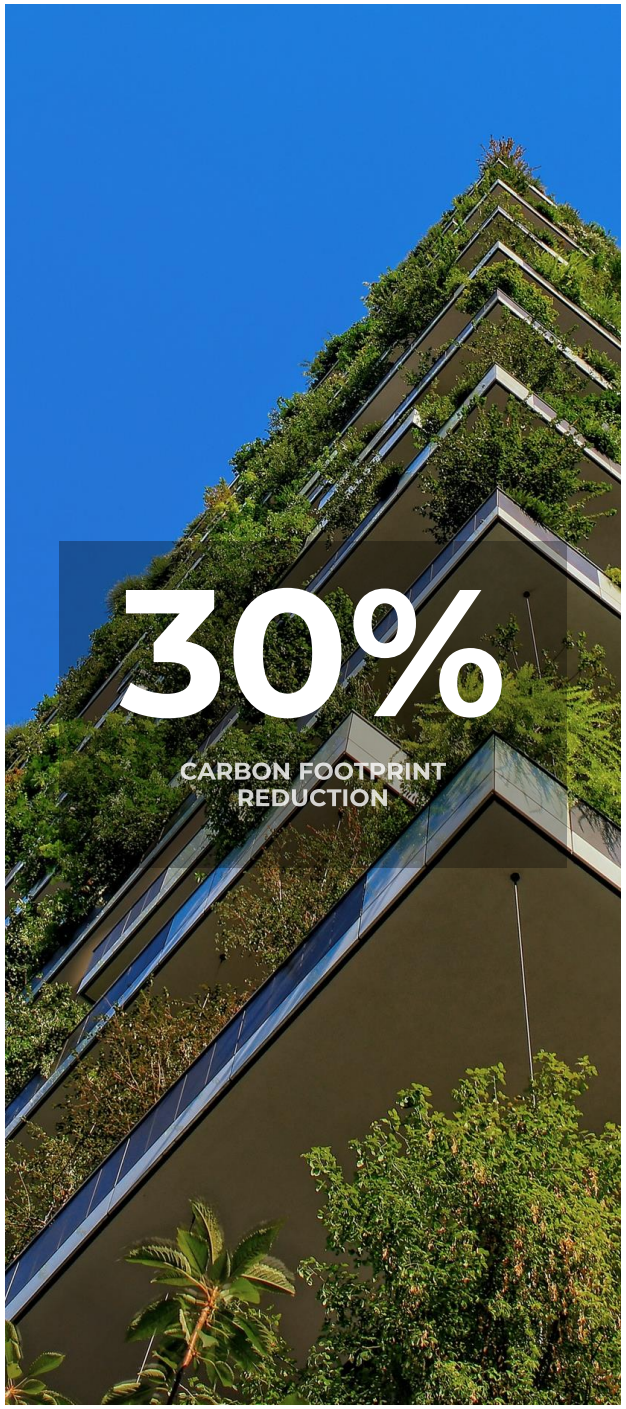
2

Million cubic yard

OPTIMIZED CONCRETE

5%

MATERIALS COST SAVINGS



30%

CARBON FOOTPRINT REDUCTION

500

Million tons of CO_2

TO BE PREVENTED FROM ENTERING THE ATMOSPHERE

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References:

[1] Song et al. *"Decarbonizing Concrete with Artificial Intelligence."* **Computational Modelling of Concrete and Concrete Structures** (2022): 168-176.

[2] Ouyang et al. *"Using Machine Learning to Predict Concrete's Strength: Learning from Small Datasets."* **Engineering Research Express 3** (2021): 015022.

[3] Ouyang et al. *"Predicting concrete's strength by machine learning: Balance between accuracy and complexity of algorithms."* **ACI Materials Journal 117** (2020).

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