Improving Data Center Energy Efficiency through End-to-End Cooling Modeling and Optimization

University of Miami, Schneider Electric, Lawrence Berkeley National Laboratory
Wangda Zuo, Assistant Professor
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Team

Wangda Zuo (PI), University of Miami
Michael Wetter, (Co-PI), Lawrence Berkeley National Laboratory
James VanGilder (Co-PI), Schneider Electric
Challenges:
Data centers in the US use about 2% of the electricity consumed in the nation and about half of this energy is used for cooling.

Vision:
At a target level of performance (30% saving in cooling energy), a nationwide adoption of this tool will potentially reduce annual electricity usage by 21 billion kWh and save about $2.2 billion. The target market size is estimated to be about $593 million in 2020.
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Technology Solution

Feature 1: Optimization of Cooling System Operation

Module 1: Flexible Models for Cooling System

Modelica

Feature 2: Optimization of Airflow Management

Module 2: Self-Learning Regression Model for Airflow Management

ISAT + FFD

Feature 3: Simultaneous Optimization of Airflow Management and Cooling Systems

Module 3: Optimization Engine for Cooling System Optimization

GenOpt
Advantage, Differentiation, and Impact

Self-Learning Fast Indoor Airflow Model

In Situ Adaptive Tabulation

Validation and Demonstration at Two Different Data Centers
- University of Miami Data Center: Chilled Water and DX Coil
- University of Massachusetts Medical School Data Center: AHU with Air Side Economizer

Flexible Packages
- Each package can be used individually
- Modelica Buildings library → Spawn-of-EnergyPlus → OpenStudio
Thank You

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