CAREER: Multifidelity Modeling and Search Using Adaptive Field Prediction

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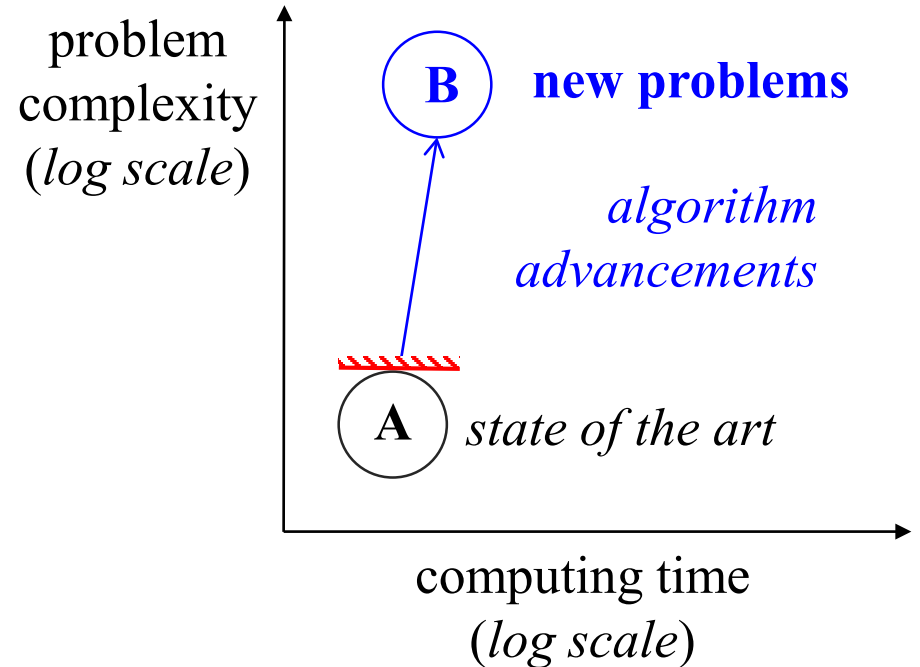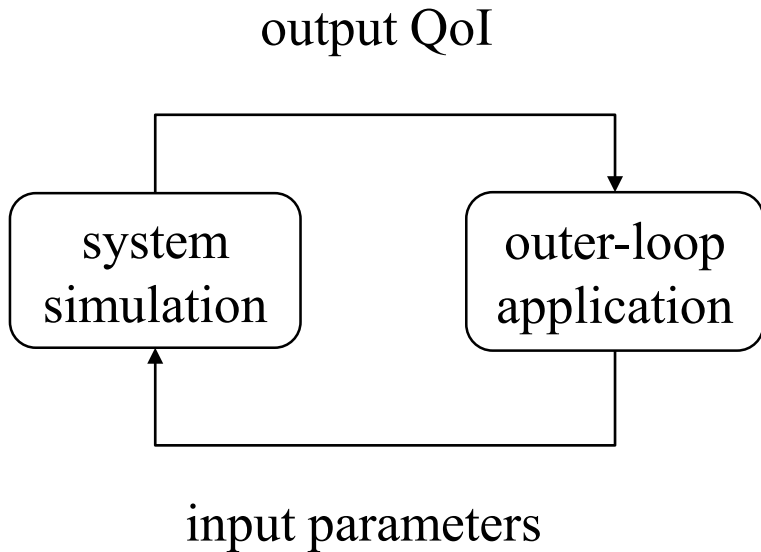
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Motivation

output QoI

```
system          outer-loop
simulation      application
```

input parameters

problem
complexity
(*log scale*)

B   **new problems**

*algorithm
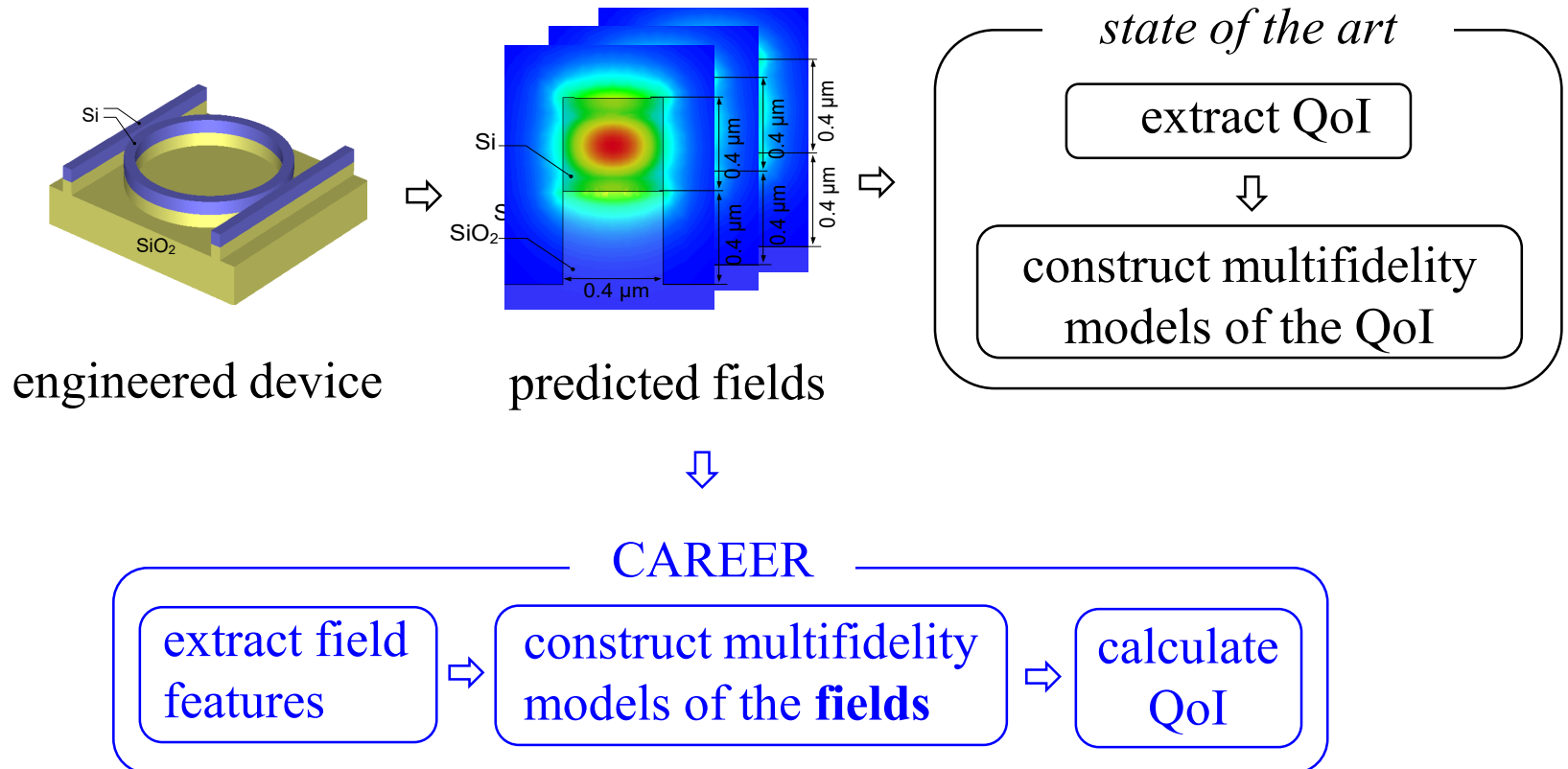advancements*

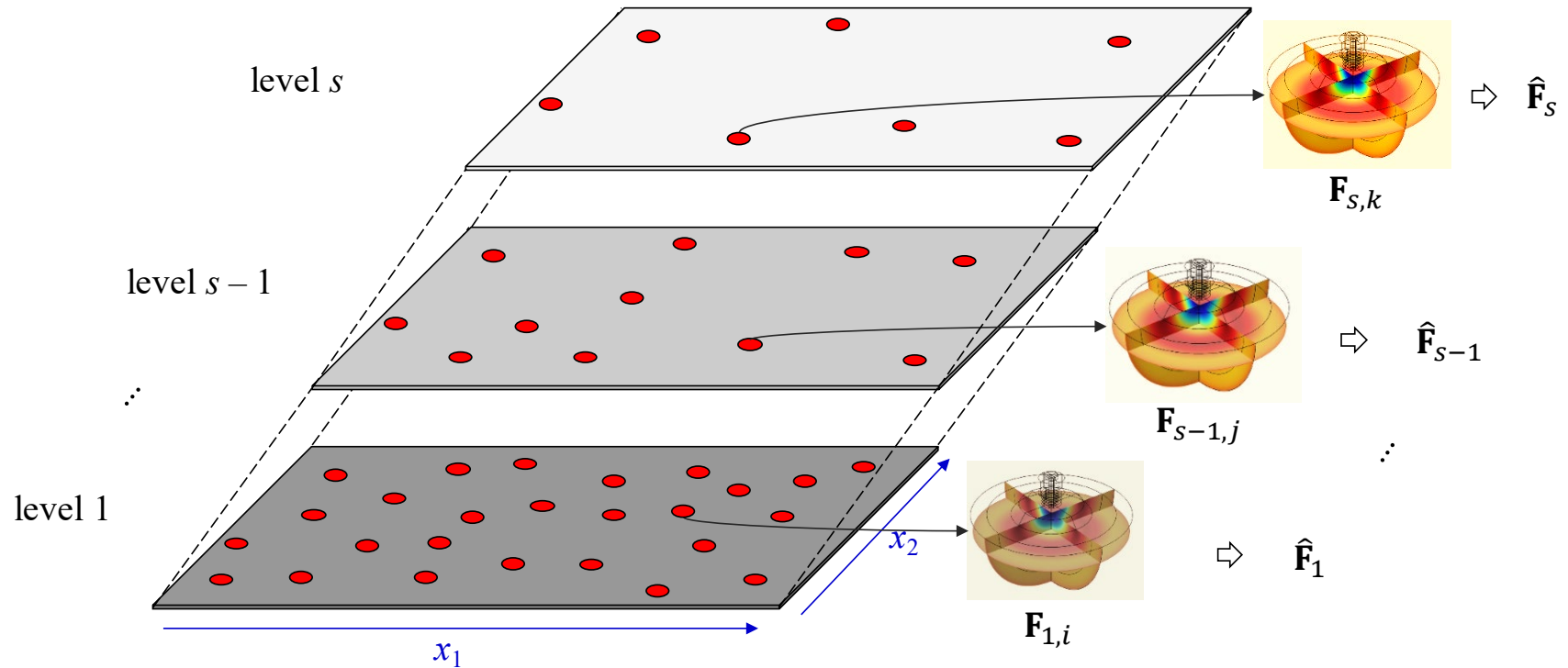**A**   *state of the art*

computing time
(*log scale*)

- A variety of high-fidelity simulations are available in support of analysis and design optimization of engineered systems

- Computational demands often mean advanced design techniques are not used to their fullest potential

Research idea

- How can the simulation prediction fields be used to enable the solution of new problems?

engineered device   predicted fields

state of the art

extract QoI

⇩

construct multifidelity models of the QoI

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extract field features ⇨ construct multifidelity models of the **fields** ⇨ calculate QoI
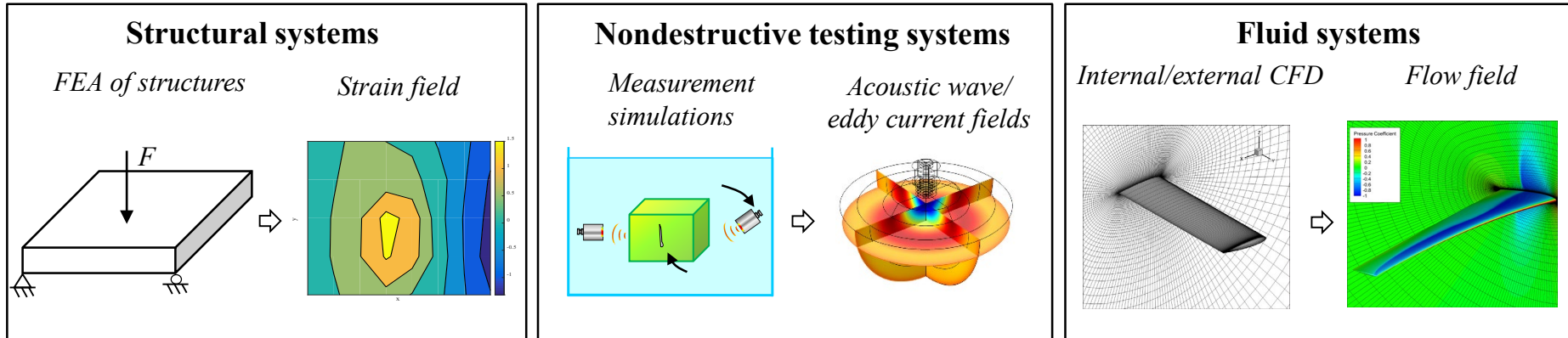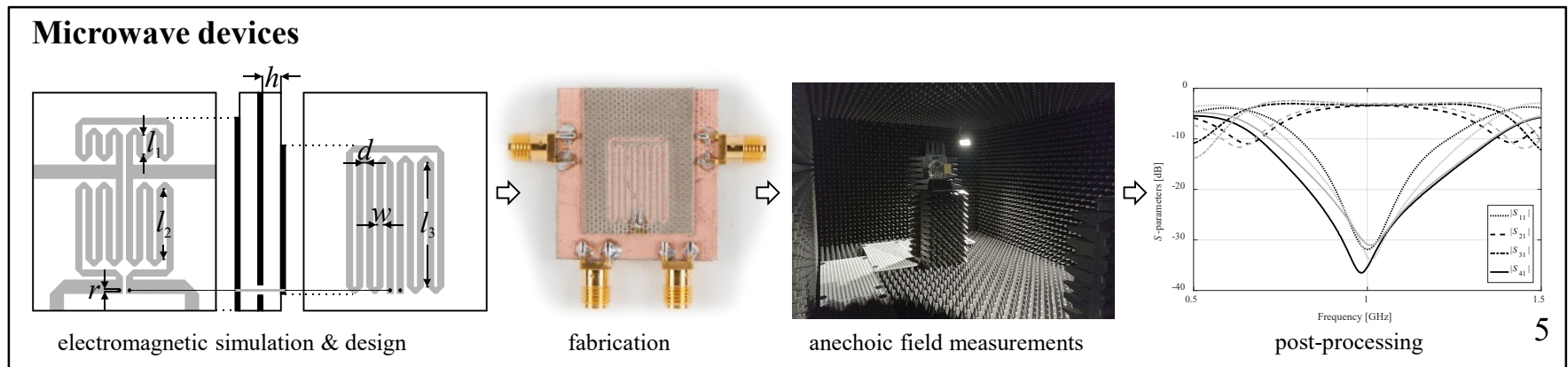
One proposed approach

- Scientific machine learning (SciML) utilized for field regression

- Fuse s-levels of SciML information with multifidelity methods

Research plan

- Derive and characterize the approaches on engineering problems:

Structural systems	Nondestructive testing systems	Fluid systems
FEA of structures *Strain field*	*Measurement simulations* *Acoustic wave/ eddy current fields*	*Internal/external CFD* *Flow field*

- Test central hypothesis using other engineering problems:

Microwave devices

electromagnetic simulation & design   fabrication   anechoic field measurements   post-processing

Thank you!