

The Internal Combustion Engine

RIP

Old
Mechanical
Engineering
Department

What made it obsolete?



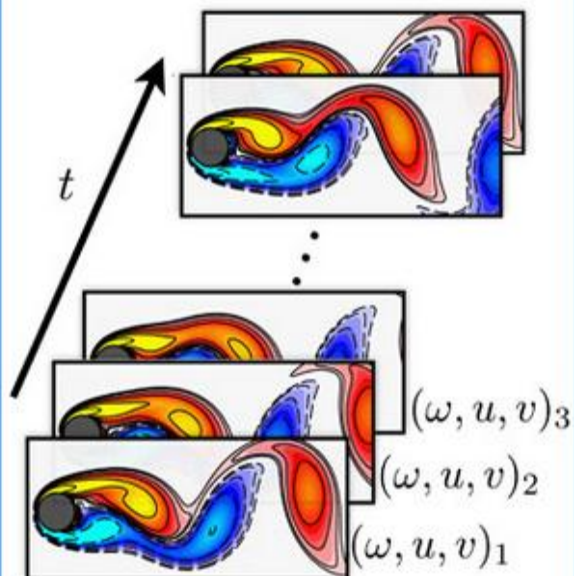
Electrical Vehicle



3D Printing and Laser cutting on new smart materials

Full data

1a. Data collection



1b. Build nonlinear library of data and derivatives

$$\begin{bmatrix} \omega_t \\ \vdots \end{bmatrix} = \begin{bmatrix} 1 \\ \omega \\ u \\ v \\ \omega_x \\ \omega_y \\ \dots \\ u\omega_x \\ u\omega_y \end{bmatrix} \begin{bmatrix} \xi \\ \vdots \end{bmatrix}$$

$$\omega_t = \Theta(\omega, u, v)\xi$$

1c. Solve sparse regression

$$\arg \min_{\xi} \|\Theta\xi - \omega_t\|_2^2 + \lambda \|\xi\|_0$$

d. Identified dynamics

$$\omega_t + 0.9931u\omega_x + 0.9910v\omega_y = 0.0099\omega_{xx} + 0.0099\omega_{yy}$$

Compare to true Navier-Stokes ($Re = 100$)

$$\omega_t + (\mathbf{u} \cdot \nabla)\omega = \frac{1}{Re} \nabla^2 \omega$$

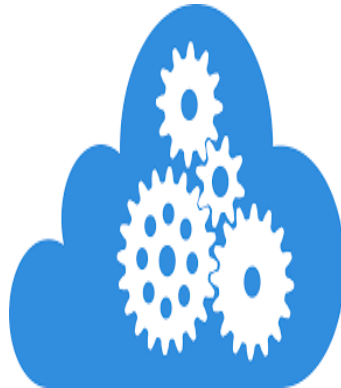
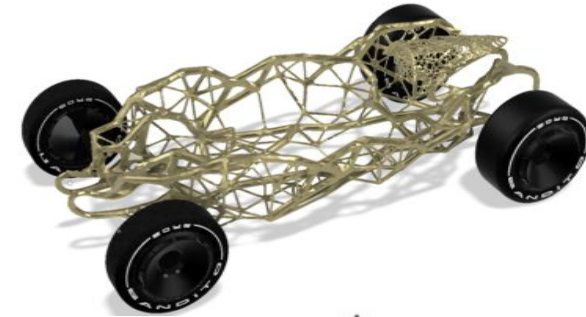
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Old Model Driven CFD

Design and manufacturing in the New Age

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Old Manufacturing Engineering Department



3D printing



One Human +

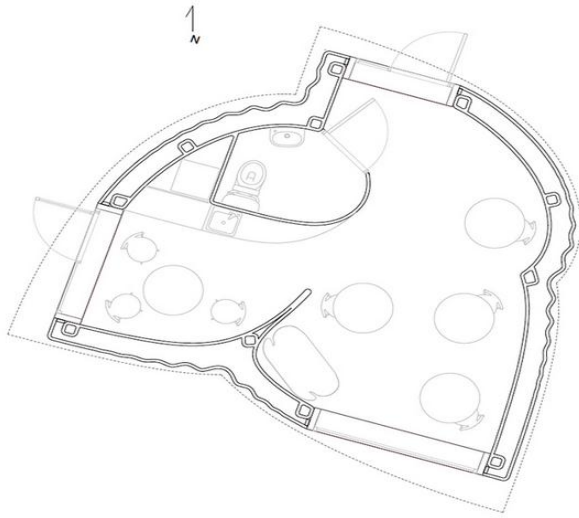
Artificial Intelligence Algorithms +

Unlimited Cloud Computing Power

=

100s to 1,000 Of Design Options





3D Printing of House with Smart materials



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Old Civil Engineering Department

Learning to Plan Chemical Syntheses

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Mike Preuss^H

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AI-assisted computational chemistry: Predicting chemical properties with minimal expert knowledge

Garrett Goh (Pacific Northwest National Lab)
1:45pm-2:25pm Thursday, June 29, 2017

Prediction of Organic Reaction Outcomes Using Machine Learning

Connor W. Coley,[†] Regina Barzilay,[‡] Tommi S. Jaakkola,[‡] William H. Green,^{*,†} and Klavs F. Jensen^{*,†}

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Quantum-chemical insights from deep tensor neural networks



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Old
Chemistry
And Chemical
Engineering
Department

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