



FSB 100

100 Years of Faculty of
Mechanical Engineering
and Naval Architecture
University of Zagreb

KATEDRA ZA KONSTRUIRANJE I RAZVOJ PROIZVODA

Konstruiranje i razvoj proizvoda

„Stalna na tom svijetu samo mijena jest...“

P. Preradović

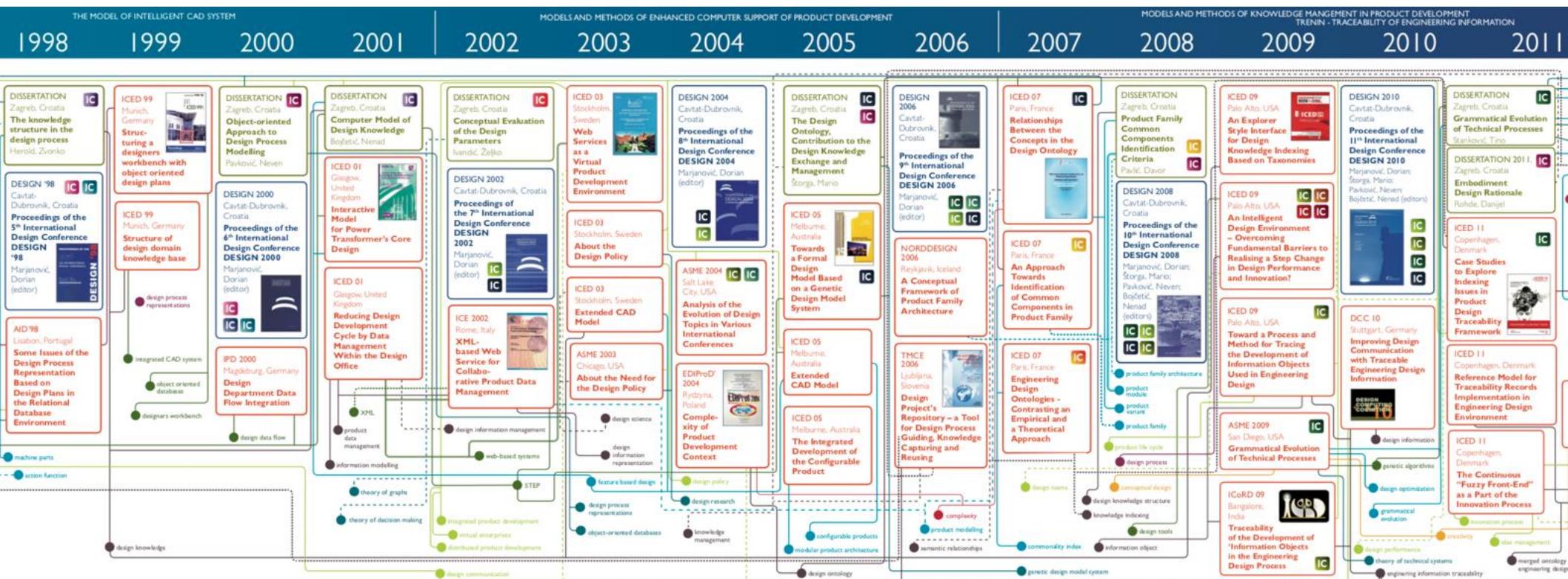
Inovacijski forum, 8. ADRIATECH 2024, Građevinski fakultet, Rijeka

Dorian Marjanović

Katedra za konstruiranje i razvoj proizvoda



Katedra za konstruiranje i razvoj proizvoda



Teme istraživanja CADLab

Eksperimentalna istraživanja u konstruiranju:

- razumijevanje obrade informacija, rasta znanja i obrazaca učenja u timskim socio-tehničkim okruženjima u odjelima za projektiranje i razvoj tehničkih sustava primjenom naprednih pristupa analizi, simulaciji i vizualizaciji za proučavanje dinamike timskog rada.

Podrška tvrtkama u razvoju - proizvoda i inovacijskog potencijala

Edukacija – Generativni CAD u nastavi, priprema studenata za rad u AI okruženju

Eksperimentalna istraživanja u konstruiranju

Konstruiranje za održivost potpomognuto UI s primjenom u inovacijskim laboratorijima



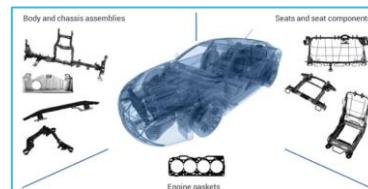
Ponašanje pojedinaca i timova tijekom razvoja – timski tranzicijski procesi u VR okruženju pri razvoju proizvoda



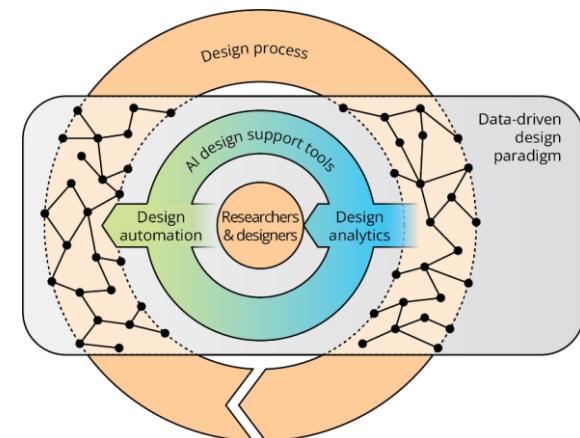
KONČAR Electrical Industry, Croatia



TPV Automotive Industry, Slovenia



Podacima vođene metode i alati za konstruiranje i inovacije



Podrška tvrtkama u razvoju - proizvoda i inovacijskog potencijala

MISSION4WATER

Multidisciplinarno strateško partnerstvo za inovativna rješenja u smanjenju raspršivanja zagađivača u vodi



cad lab

**B&O
BAU**

Analiza i modularizacija prefabriciranih kupaonica



Model-Based Systems Engineering (MBSE)

Transdisiplinarni pristup koji podržava razvoj kompleksnih inženjerskih sustava



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Medunarodna suradnja u nastavi

HOME NEWS CHAIR EDUCATION RESEARCH INDUSTRY TIMELINE Contact Login Hrvatski ?

EGPR
Multidisciplinary and multicultural global products development experience
[MORE...](#)

NEWS
Enrolment in EGPR elective course is now open
WEDNESDAY, JANUARY 25TH 2023
Želite raditi na stvarnim industrijskim problemima i to u okviru kolegija na fakultetu? Prijavite se na međunarodni kolegij E...

EVENTS
Summer School on Engineering Design Research 2023
FRIDAY, FEBRUARY 24TH 2023
The first week of the 24th Summer School on Engineering Design Research will be held in Croatia (Samobor) from June 11th to 1...

SCIENTIFIC PROJECTS
Traceability of Engineering Information (TRENIN)
PERIOD: 2009 - 2011
Principal researcher: Mario Štorga

FRI, FEBRUARY 17TH 2023 Prof. Dorian Marjanović, PhD. M.E. will
WORKSHOP WEDNESDAY, JANUARY 30TH
INNOVATION MANAGEMENT IN Complex Engineering

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- Od 2003. European Global Product Realisation Course
- Joint Master in Development of Smart Products



TECHNISCHE
UNIVERSITÄT
WIEN



University of Ljubljana



POLITECNICO
MILANO 1863

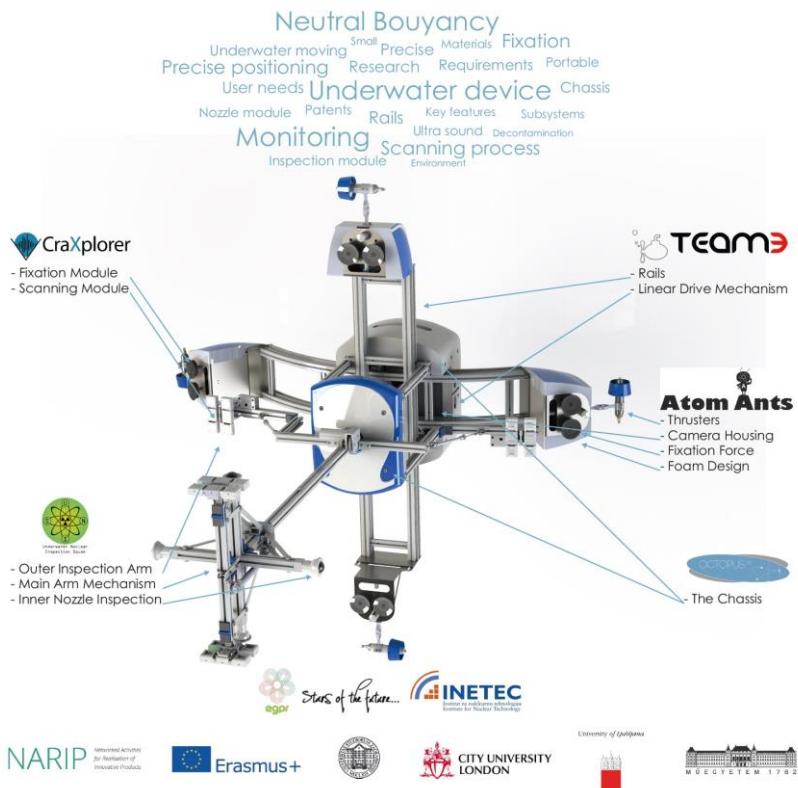


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Edukacija

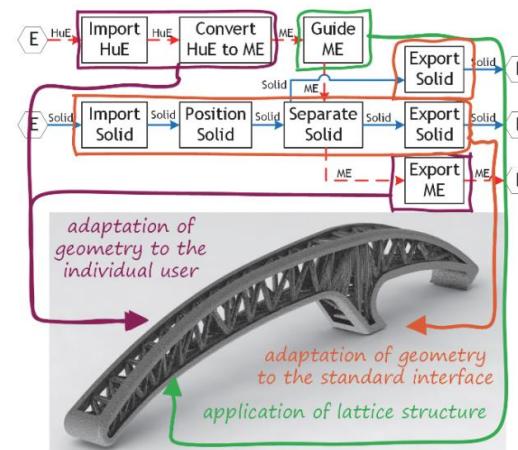
EGPR – NARIP - ELPID

<https://cadlab.fsb.hr/nastava/medjunarodna-nastava/egpr>



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Konstruiranje za aditivnu proizvodnju i sinteriranje INEX-ADAM



<https://projects.research-and-innovation.ec.europa.eu/hr/projects/success-stories/all/stvaranje-novih-prilik-za-suradnju-u-aditivnoj-proizvodnji>



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DESIGN2024

18th INTERNATIONAL DESIGN CONFERENCE
20–23 MAY 2024, CAVTAT – DUBROVNIK – CROATIA



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100

design2024@fsb.hr
www.designconference.org

the Design Society
a worldwide community
cad lab

International DESIGN Conference



www.designconference.org



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Konstruiranje

..... je

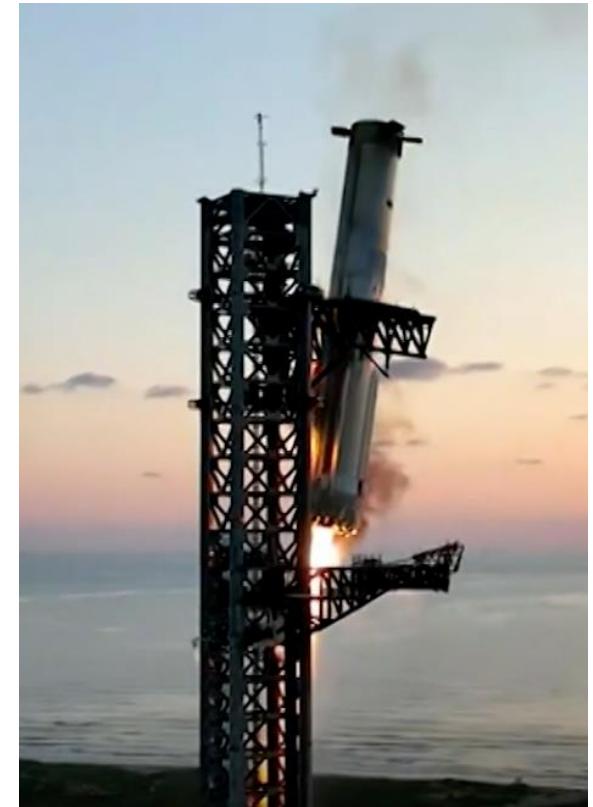
Konstruiranje

..... je omogućilo preživljavanje ljudske vrste.

Konstruiranje



Pogon za proizvodnju sjekira otkriven u Maroku,
2021. Starost 1,3 mil. godina



Povratak pogonske rakete, SpaceX
Starship 13.10. 2024.

Tehnika i tehnologija nas okružuju



Tehnika i tehnologija nas okružuju



Tehnika i tehnologija nas okružuju



45 godina u konstruiranju i razvoju proizvoda

U prvim godinama karijere gledao sam i sudjelovao u razvoju i primjeni računala u konstruiranju iz prvog reda

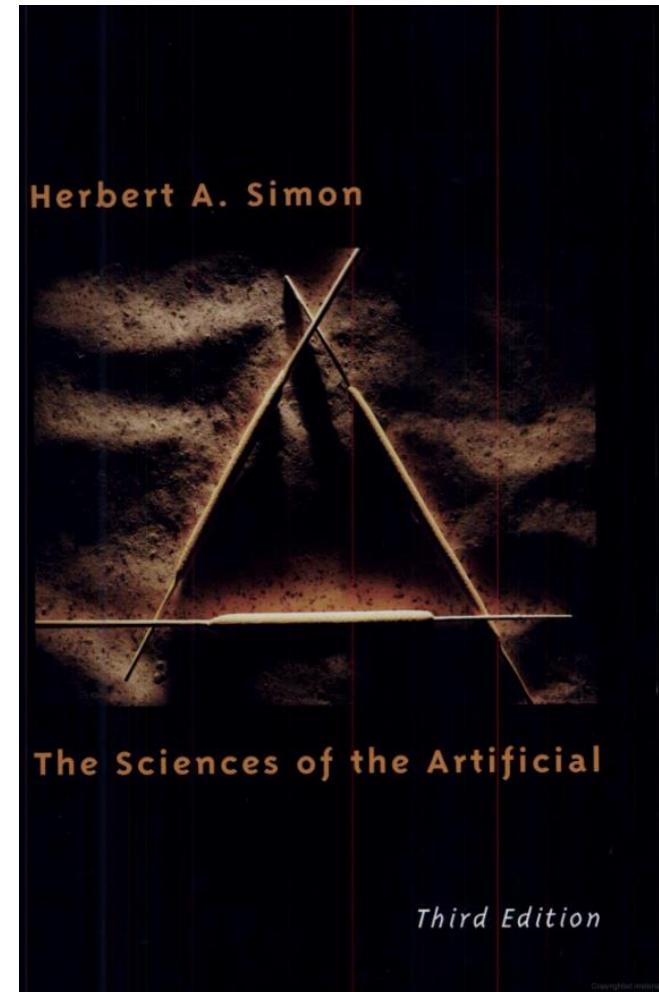
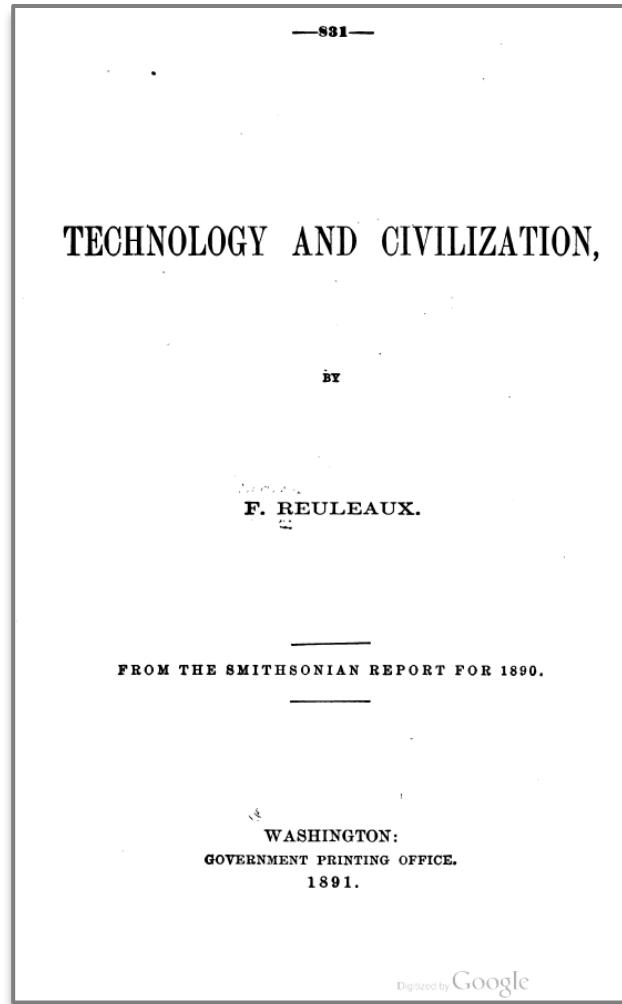
Nedavno me pitali kako gledam na promjene od početaka primjene računala i CAD

Danas smo na opet na početku, početku primjene AI u razvoju proizvoda

Konstruiranje

.... je ?

Konstruiranje



Konstruiranje

'everyone designs who devises courses of action aimed at changing existing situations into preferred ones'

Herbert A. Simon The Science of Artificial, MIT Press. 1969.

.... Konstruiranjem mijenjamo svijet

Konstruiranje

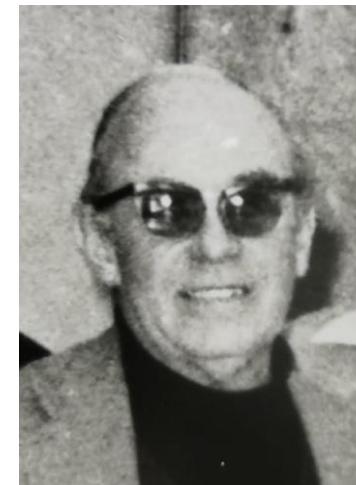
- ... aktivnost kojom postojeću situaciju činimo boljom
- ... aktivnost koja nam je omogućilo preživljavanje...

Primjena računala u konstruiranju

- CAD je oko nas više od 60 godina – generacije razvoja, razvoja koji je nastao suradnjom istraživača i industrije
- Istraživanja na sveučilištima su bila ključna za razvoj!
- Nekada smo bili orijentirani na razvoj proizvoda i determinističke alate.
- Danas smo svjesni socijalnog, društvenog utjecaja proizvoda na ponašanje pojedinaca i društvo, brinemo o okolišu i na sasvim novom početku: početku primjene AI u razvoju proizvoda

Prapočetci

Početak istraživanja i primjene teoretskih i praktičnih pristupa metodičkog konstruiranja, razvoja proizvoda i primjene računala u životnom vijeku tehničkih sustava, na Fakultetu strojarstva i brodogradnje obilježili su 70-te godine.

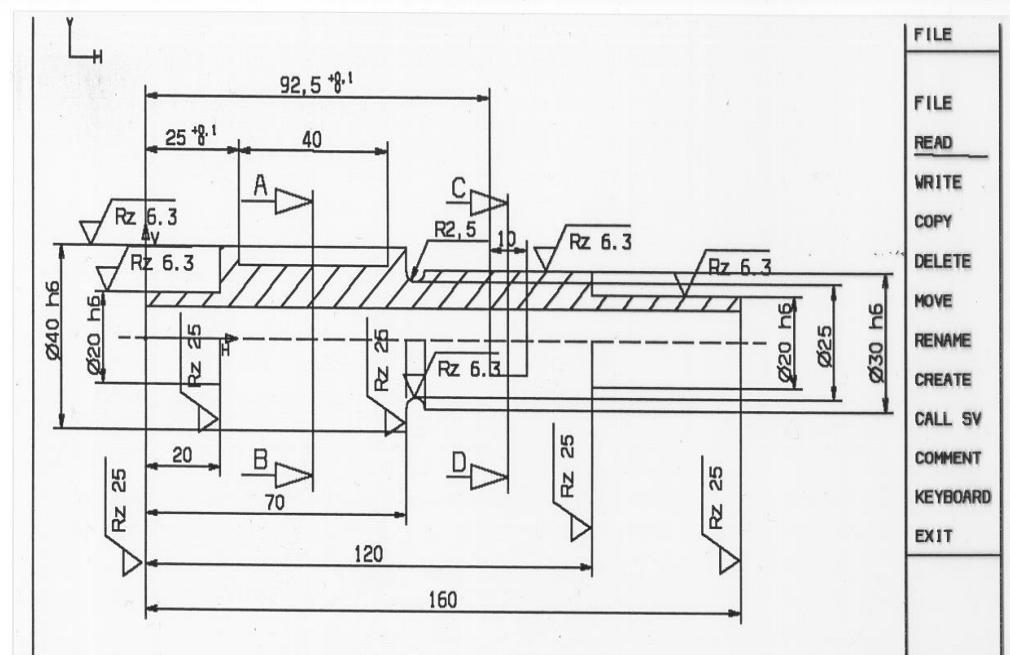
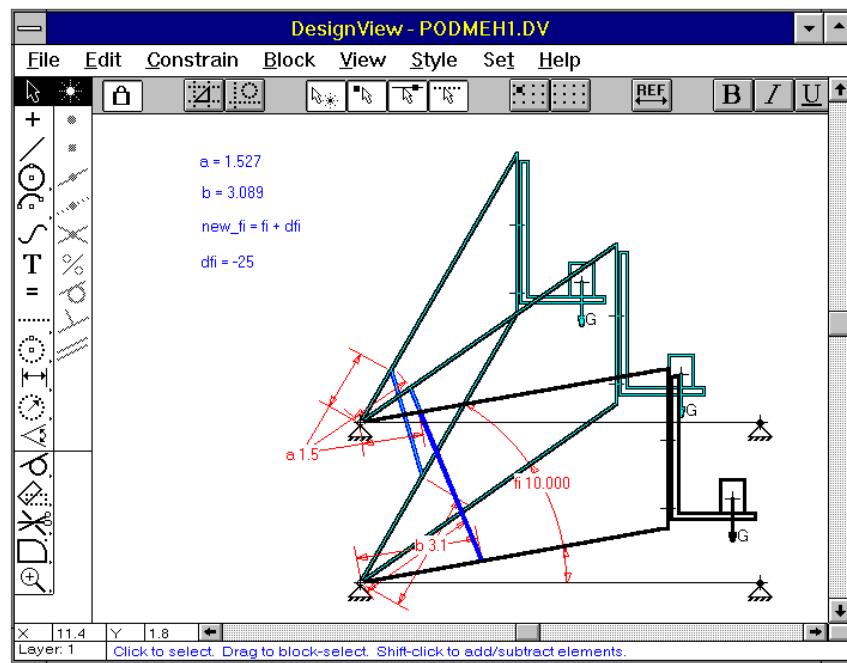


Prof. dr. sc. Eugen
Oberšmit
(1933.-1983.)

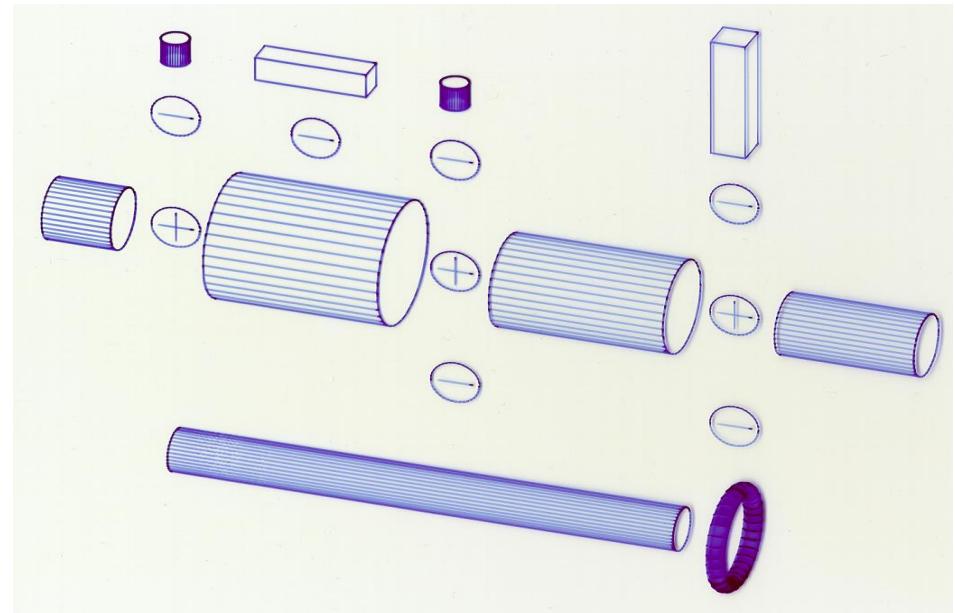
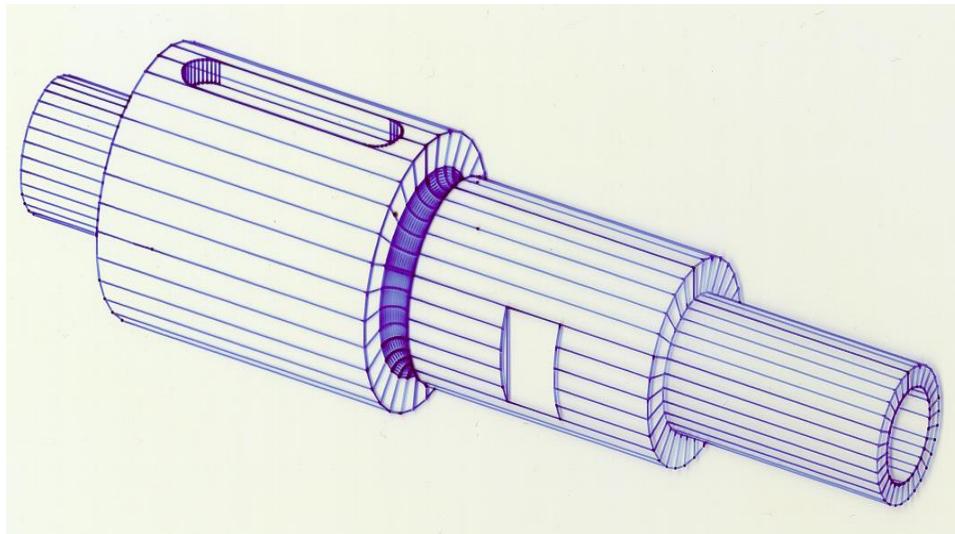


Prof. dr. sc. Aurel Kostelić
(1983.-1996.) .

Proračuni i programi za crtanje



3D Modeliranje



CADLab 1986.



1993 SolidWorks

- Windows platforma
- 3D modeliranje
- Niska cijena

- ◆ **CAD/CAE SW:**

- Pro/ENGINEER & Pro/Mechanica
- CATIA V6R9(R10)
- SolidWorks 2003
- Autodesk Inventor
- AMD 6, AutoCAD 2002
- I-DEAS
- Smarteam

- **Analysis SW**

- Nastran
- Algor.....

- ◆ **Graphical Design SW:**

- Corel Graphics 11 Suite
- Adobe Photoshop, InDesign
- Macromedia Freehand

- ◆ **Applicaton Dev. SW**

- Microsoft Visual Studio 6
- Microsoft Visual Studio .Net

Katedra za osnove konstruiranja - RIIG 2.dio -
2003/04

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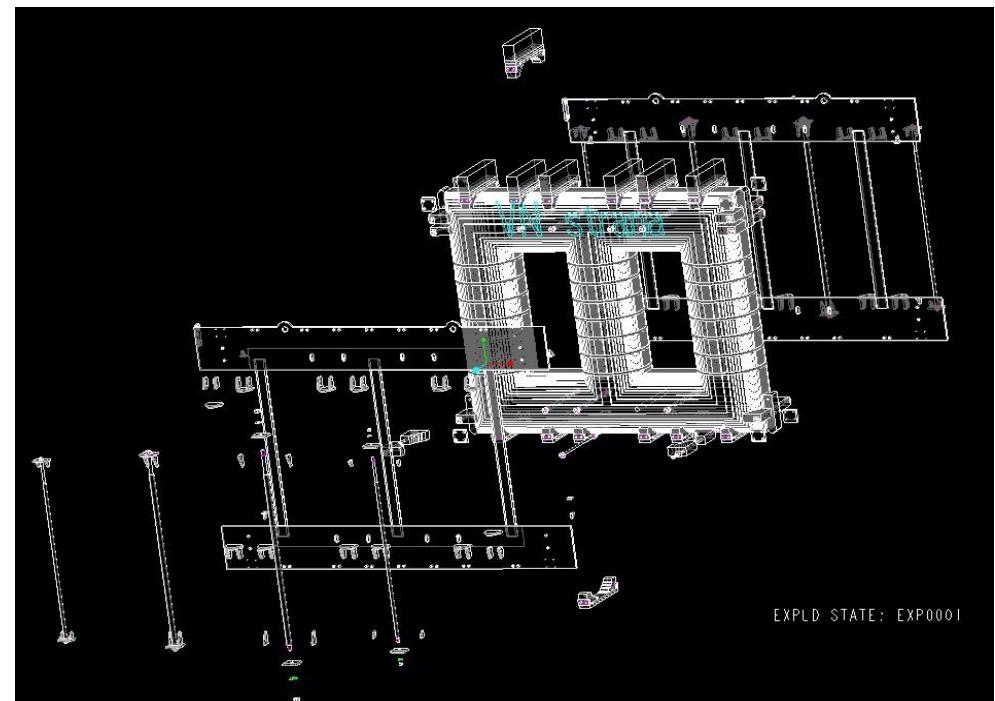
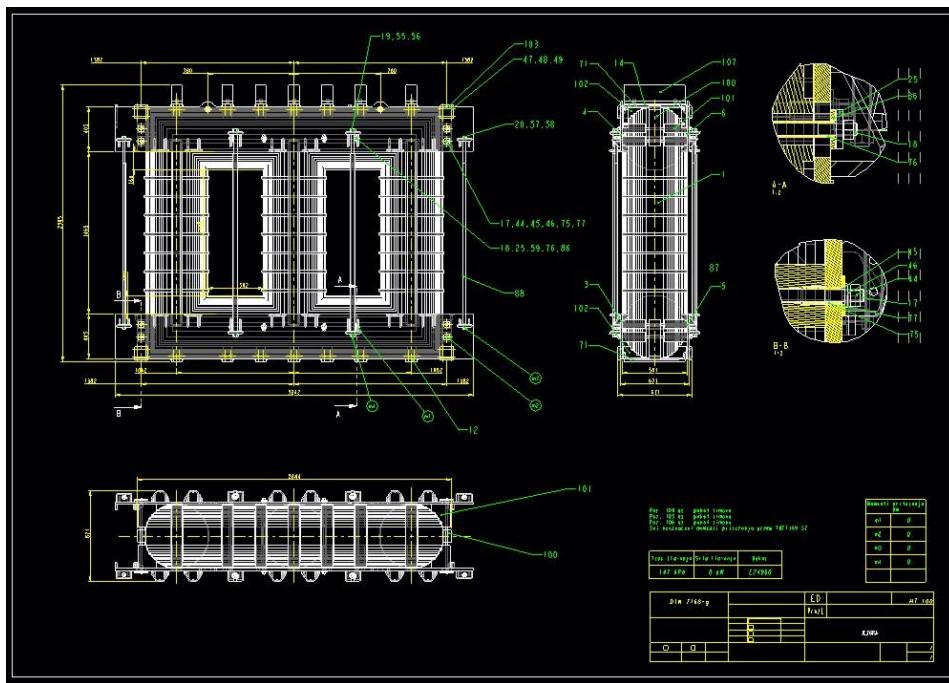
cad lab



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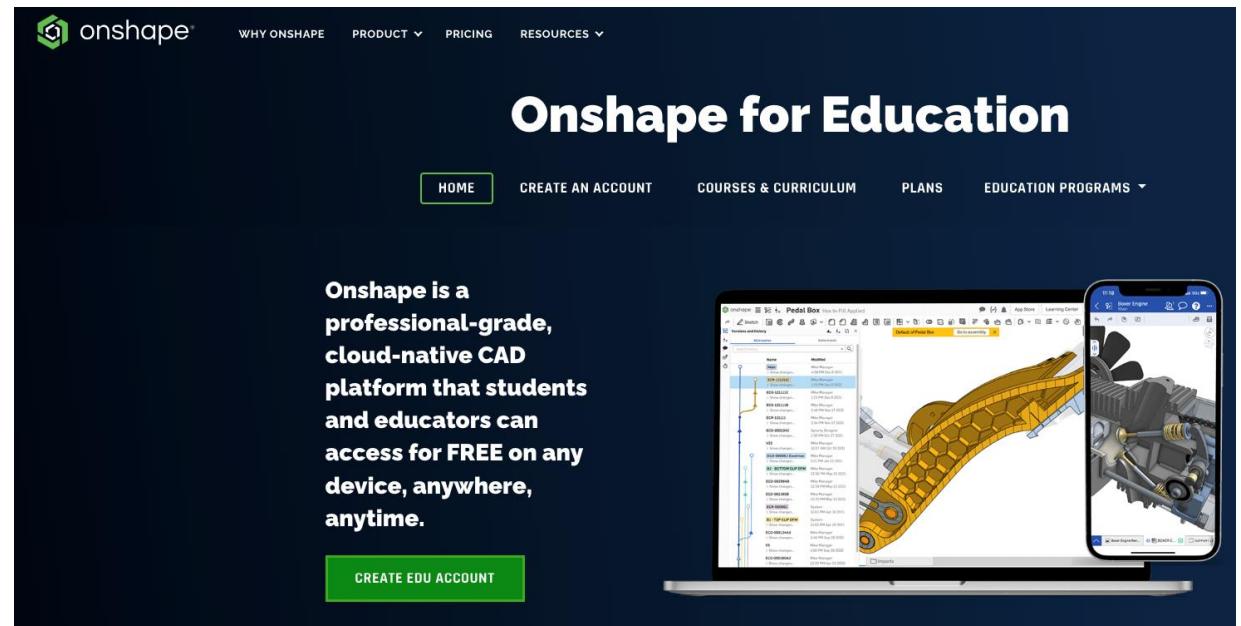
Aplikacije u 3D

KPT KONČAR TRANSFORMATORI



2015 Onshape

- Cloud Native CAD
- PDM
- Web suradnja

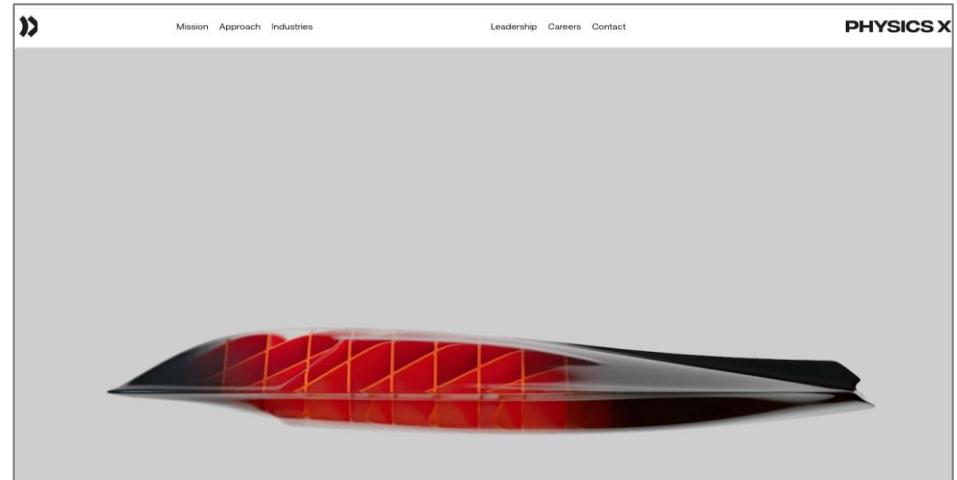


AI u simulacijama

- Surogati za simulacije
- 100-1000 X ubrzanje



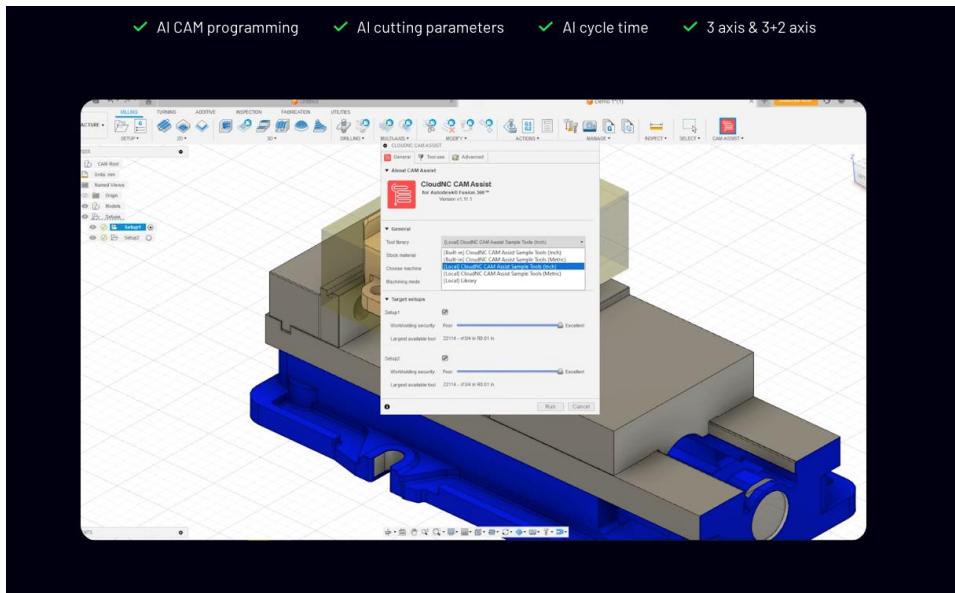
<https://www.neuralconcept.com/>



<https://www.physicsx.ai/>

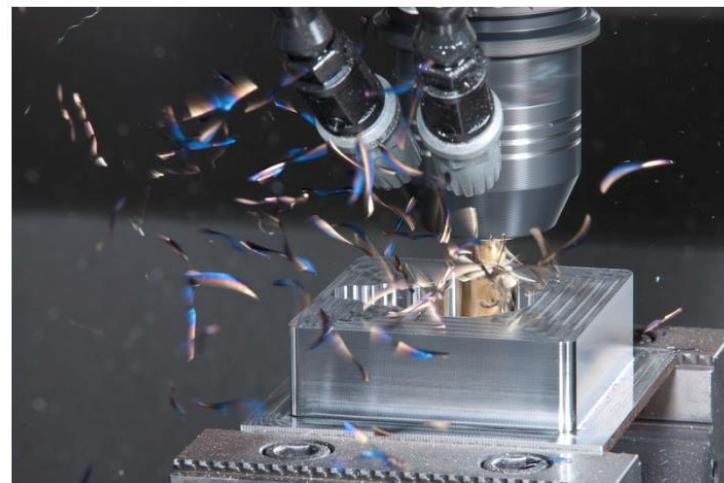
CloudNC generativni CAM

Sati programiranja - minute



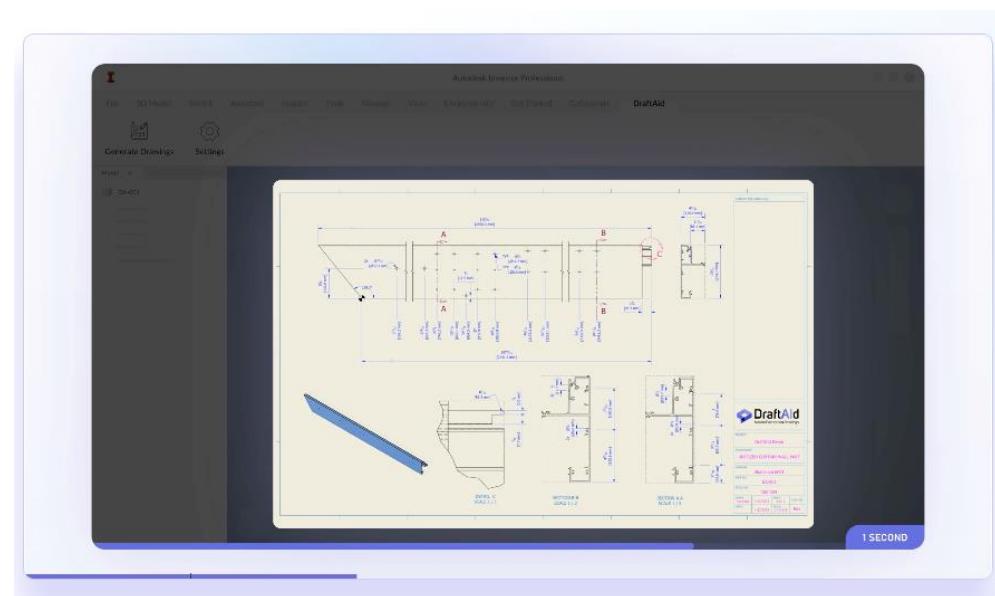
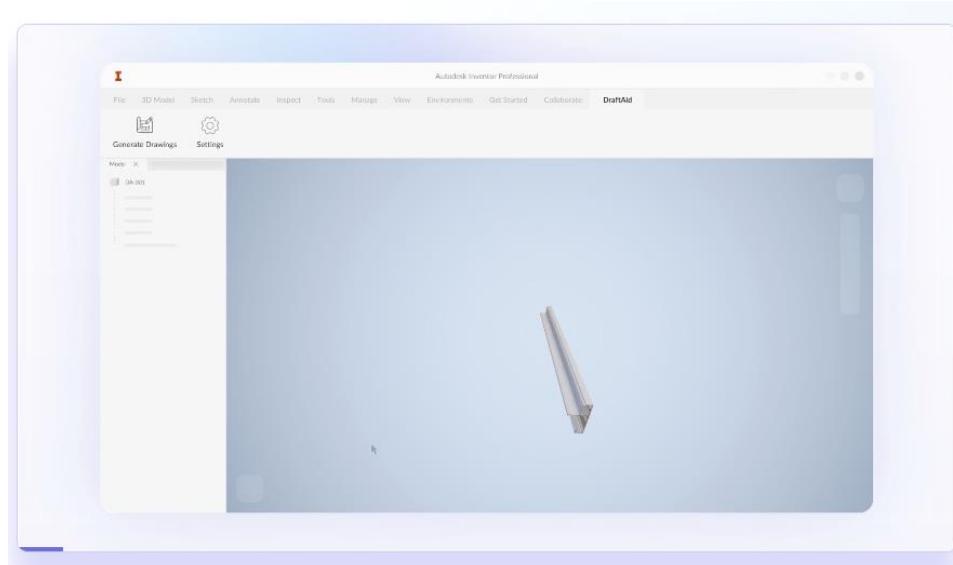
<https://www.cloudnc.com/cam-assist>

Generative manufacturing: or how to transform how we make everything, forever



By Chris Emery, CloudNC co-founder

Crteži generirani AI



<https://draftaid.io/>

Oblikovanje

Vizcom.ai



Koncipiranje

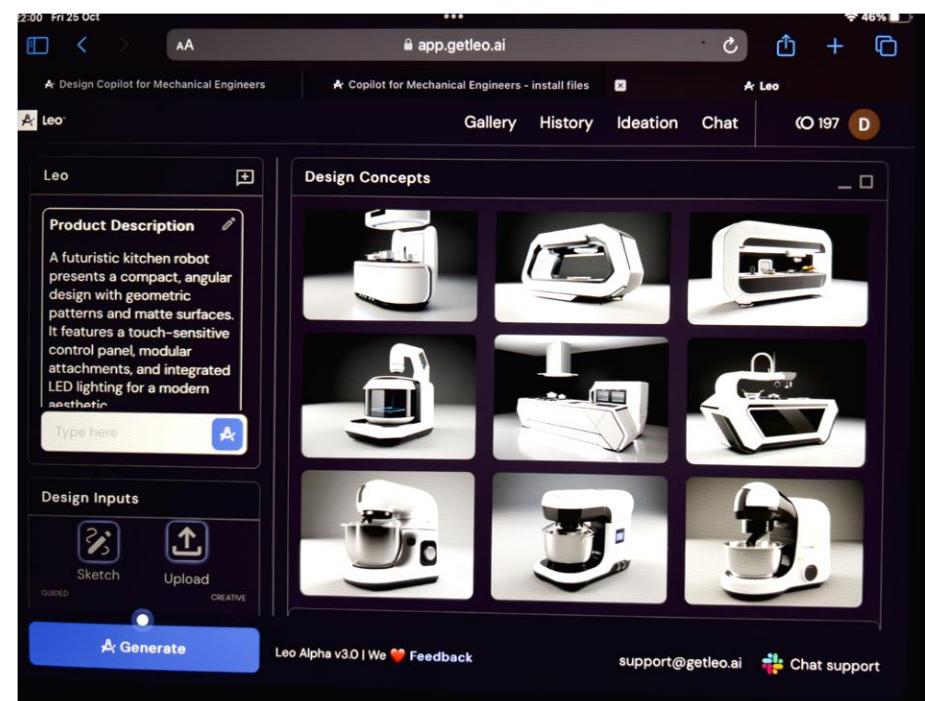
Leo Ideation

Daj mi ideju oblikovanja malog i značnog kuhinjskog robota.

3 rješenja

....

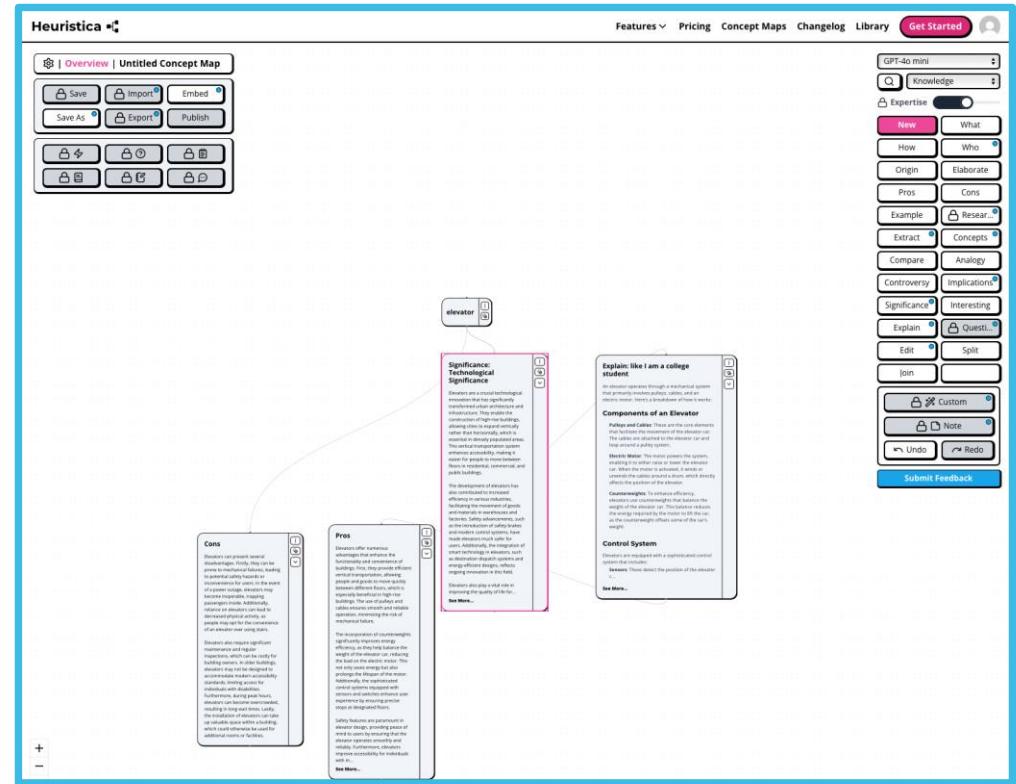
27 rješenja



Mind map

Heuristica,

Pretraživanje , strukturiranje



Analiza teksta

Perplexity, Explainpaper,....

Chatbot

What's the ultimate tensile strength of 304 stainless steel?

Sources

All About 304 Stainless Steel (Properties...) thomasnet • 1

What is 304 Stainless Steel? - Masteel masteel.co • 2

304 vs. 316 stainless steel: what's the... essentracompan... • 3 View 2 more

Answer

According to the search results, the ultimate tensile strength of 304 stainless steel is:

The tensile strength of 304 stainless steel is at a minimum of 515 MPa and can typically reach 625 MPa as a maximum. [1](#) [2](#)

The search results also provide the following additional details on the tensile strength of 304 stainless steel:

- The tensile strength of 304 stainless steel is 515 MPa or 74700 psi. [1](#)
- The tensile strength of 304 stainless steel can vary based on the specific composition, but is generally in the range of 515-625 MPa. [1](#) [2](#)

So in summary, the ultimate tensile strength of 304 stainless steel is typically in the range of 515-625 MPa, with a minimum of 515 MPa and a maximum of 625 MPa.

AI u razvoju proizvoda

- Primjena standarda (tvrtke, struke)
- Detekcija anomalija
- Liste zahtjeva i specifikacije
- Učenje u realnom vremenu
- Timski rad
- Generativni dizajn

Kako se snaći danas



arXiv > cs > arXiv:2307.14377

Search Help | .

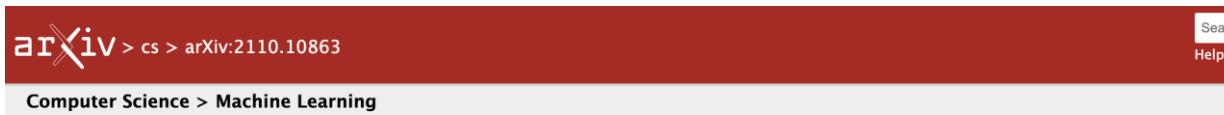
Computer Science > Computation and Language

[Submitted on 25 Jul 2023]

How Can Large Language Models Help Humans in Design and Manufacturing?

Liane Makatura, Michael Foshey, Bohan Wang, Felix Hähnlein, Pingchuan Ma, Bolei Deng, Megan Tjandrasuwita, Andrew Spielberg, Crystal Elaine Owens, Peter Yichen Chen, Allan Zhao, Amy Zhu, Wil J Norton, Edward Gu, Joshua Jacob, Yifei Li, Adriana Schulz, Wojciech Matusik

The advancement of Large Language Models (LLMs), including GPT-4, provides exciting new opportunities for generative design. We investigate the application of this tool across the entire design and manufacturing workflow. Specifically, we scrutinize the utility of LLMs in tasks such as: converting a text-based prompt into a design specification, transforming a design into manufacturing instructions, producing a design space and design variations, computing the performance of a design, and searching for designs predicated on performance. Through a series of examples, we highlight both the benefits and the limitations of the current LLMs. By exposing these limitations, we aspire to catalyze the continued improvement and progression of these models.



arXiv > cs > arXiv:2110.10863

Search Help | .

Computer Science > Machine Learning

[Submitted on 21 Oct 2021 (v1), last revised 16 Mar 2022 (this version, v4)]

Deep Generative Models in Engineering Design: A Review

Lyle Regenwetter, Amin Heyrani Nobari, Faez Ahmed

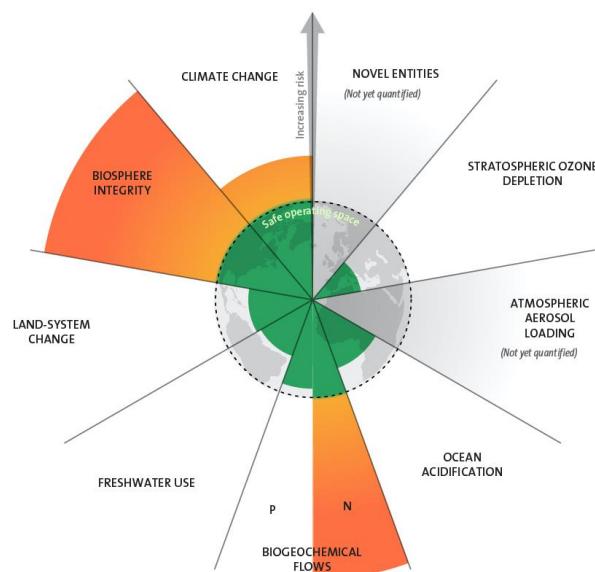
Automated design synthesis has the potential to revolutionize the modern engineering design process and improve access to highly optimized and customized products across countless industries. Successfully adapting generative Machine Learning to design engineering may enable such automated design synthesis and is a research subject of great importance. We present a review and analysis of Deep Generative Machine Learning models in engineering design. Deep Generative Models (DGMs) typically leverage deep networks to learn from an input dataset and synthesize new designs. Recently, DGMs such as feedforward Neural Networks (NNs), Generative Adversarial Networks (GANs), Variational Autoencoders (VAEs), and certain Deep Reinforcement Learning (DRL) frameworks have shown promising results in design applications like structural optimization, materials design, and shape synthesis. The prevalence of DGMs in engineering design has skyrocketed since 2016. Anticipating continued growth, we conduct a review of recent advances to benefit researchers interested in DGMs for design. We structure our review as an exposition of the algorithms, datasets, representation methods, and applications commonly used in the current literature. In particular, we discuss key works that have introduced new techniques and methods in DGMs, successfully applied DGMs to a design-related domain, or directly supported the development of DGMs through datasets or auxiliary methods. We further identify key challenges and limitations currently seen in DGMs across design fields, such as design creativity, handling constraints and objectives, and modeling both form and functional performance simultaneously. In our discussion, we identify possible solution pathways as key areas on which to target future work.

- Pitajte -zname koga

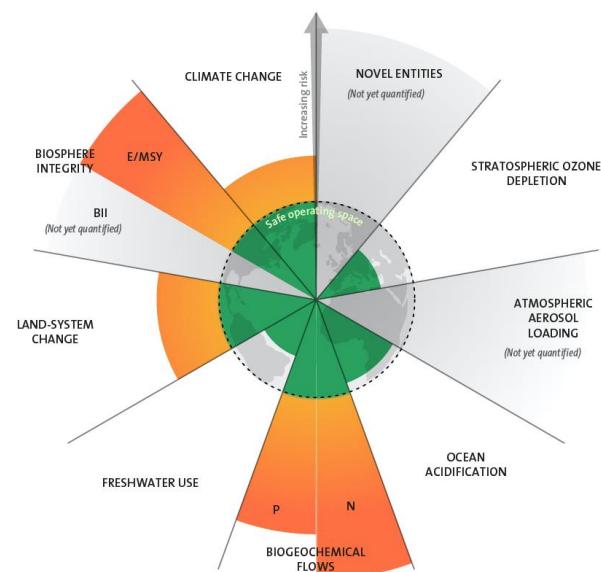
Izazovi

Izazovi – planetarne granice

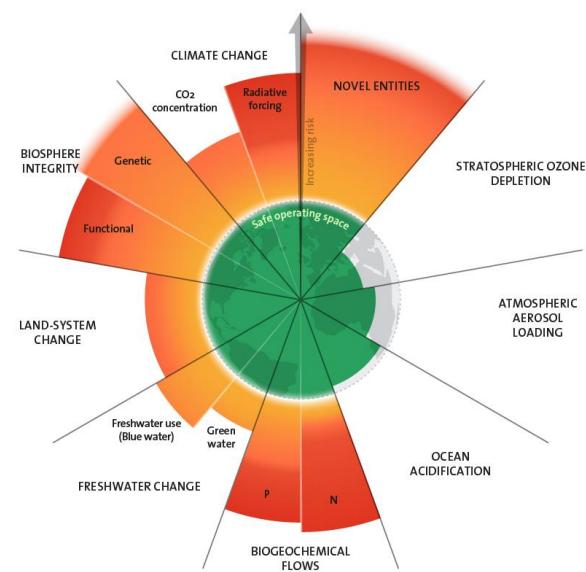
2009



2015



2023

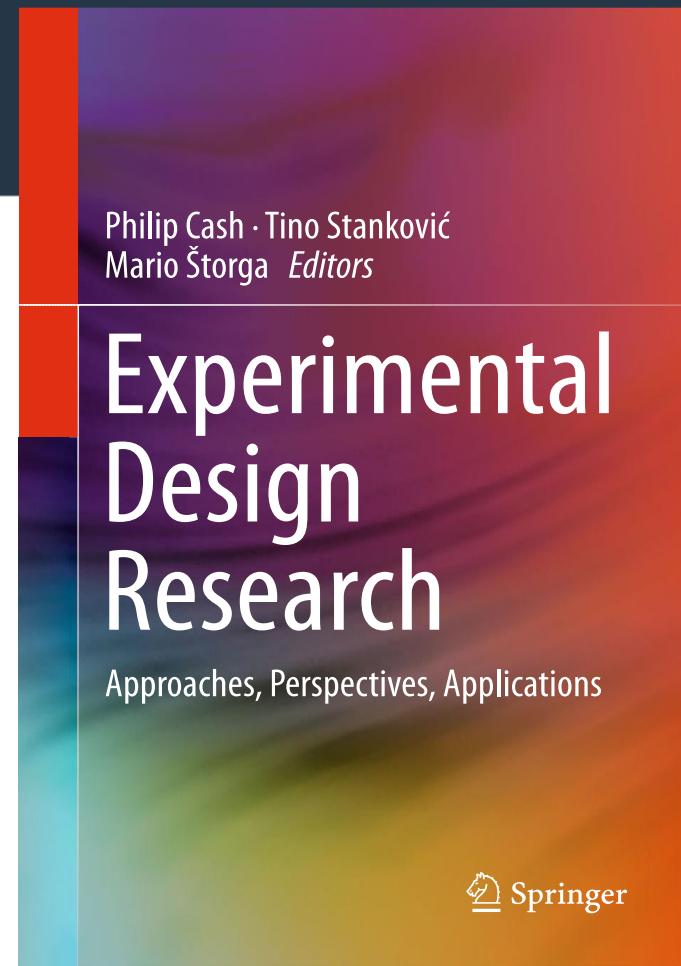


7 boundaries assessed,
3 crossed

7 boundaries assessed,
4 crossed

9 boundaries assessed,
6 crossed

Planetary boundaries Azote for Stockholm Resilience Centre



Hvala !