MATLAB EXPO

科学济世，工程扶危
—致敬抗疫工作者

曹新康

MathWorks中国区总经理

"从来没有……让世界上这么多的研究人员如此迫切地关注一个课题。"

——纽约时报 I 2020年4月1日

Products Solutions Academia Support Community Events Get MATLAB

Solutions

Search MathWorks.com

Scientists and engineers worldwide are battling the COVID-19 pandemic. Here are some examples of their work, including epidemiological analysis, diagnostics, and ventilator models.

Research and Development

Ventilator Resources

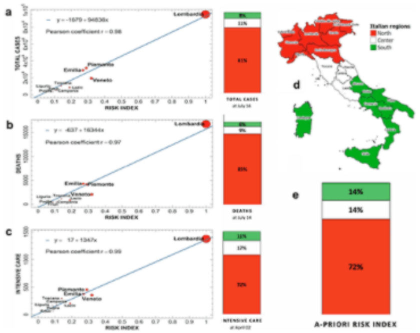
COVID-19 Research and Development with MATLAB and Simulink

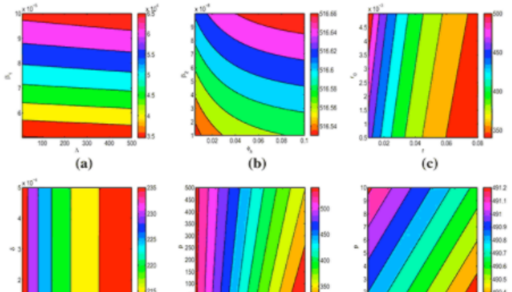
» View previous research posts

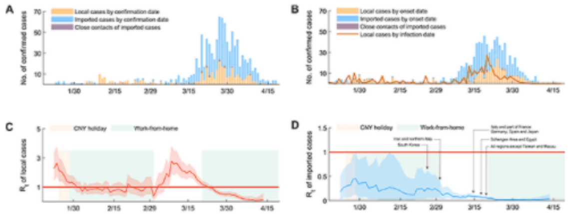
A novel methodology for epidemic risk assessment of COVID-19 outbreak

A. Pluchino et al, Nature: Scientific Reports, March 5 2021

paper







数据处理

深度学习和人工智能

自主系统

基于模型的设计

云和在线平台


Wuhan, China

Wuhan, China

World Health Organization

Novel Coronavirus (2019-nCoV)

SITUATION REPORT – 1 | 21 JANUARY 2020

The NEW ENGLAND JOURNAL of MEDICINE

RESULTS

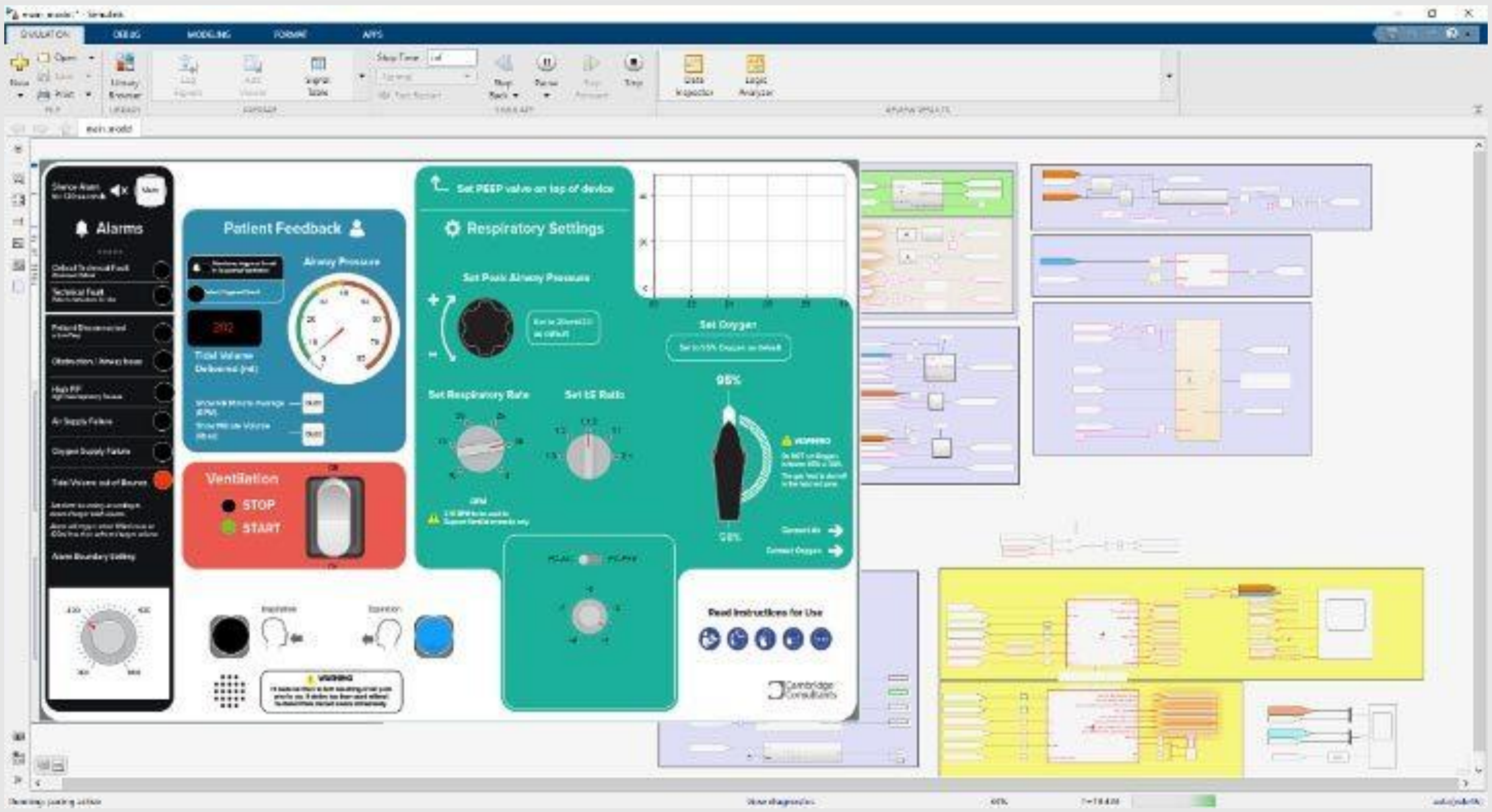
Among the first 425 patients with confirmed NCIP, the median age was 59 years and 56% were male. The majority of cases (55%) with onset before January 1, 2020, were linked to the Huanan Seafood Wholesale Market, as compared with 8.6% of the subsequent cases. The mean incubation period was 5.2 days with the 95th percentile of the distribution at 12.5 days. In its early stages, the epidemic doubled in size every 7.4 days. With a mean serial interval of 7.5 days, the basic reproductive number was estimated to be 2.2.

Cambridge, United Kingdom

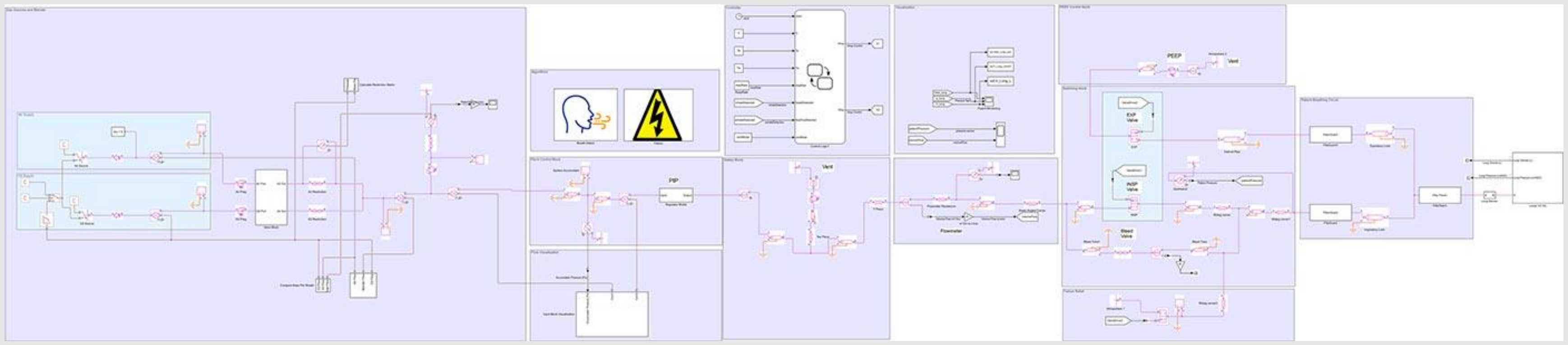
Cambridge, United Kingdom


Silence Alarm for 120 seconds
Alarms
Critical Technical Fault
Technical Fault
Patient Disconnected
Obstruction / Airway Issue
High Peak Inspiratory Pressure
Air Supply Failure
Oxygen Supply Failure
Tidal Volume out of Bounds
Alarm Boundary Setting
Set alarm boundary according to desired target tidal volume.
Alarm will trigger when 100ml more or 100ml less than selected target volume.
600ml
500ml
300ml
400ml
Patient Feedback
Airway Pressure
Tidal Volume Delivered (ml)
Show RR Minute Average (BPM)
Show Minute Volume (litres)
Ventilation
STOP
START
Inspiration
Expiration
WARNING
Fit bacterial filters to both breathing circuit ports prior to use. If device has been used without bacterial filters discard device immediately.
Set PEEP valve on top of device
Respiratory Settings
Read Instructions for Use
Set Inspiratory Pressure
Set Inspiratory Pressure to achieve a tidal volume of 400ml at startup with a test lung
Set Respiratory Rate
Set I:E Ratio
BPM
Set Oxygen
100%
58%
40%
Connect Oxygen
Connect Air
Set Breathing Mode
Pressure Support Ventilation
Set Inspiration Trigger Pressure
OFF
cmH2O Below PEEP
VELOCI-VENT

47天设计完成


Alarms
Patient Feedback
Airway Pressure
Tidal Volume Delivered (ml)
Ventilation
STOP
START
Set PEEP valve on top of device
Respiratory Settings
Set Peak Airway Pressure
Set Respiratory Rate
Set I:E Ratio
Set Oxygen
95%
Read Instructions for Use
Cambridge Consultants

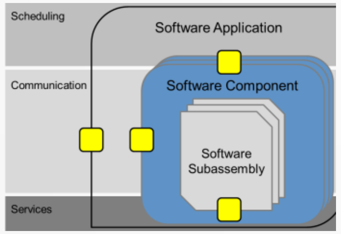
Simscape中的气动系统模型




Alarms
Patient Feedback
Airway Pressure
Ventilation
STOP
START
Set PEEP valve on top of device
Respiratory Settings
Set Oxygen
Read Instructions for Use


Silence Alarm
for 120 seconds
Alarms
Critical Technical Fault
Technical Fault
Patient Disconnected
Obstruction / Airway Issue
High Peak Inspiratory Pressure
Air Supply Failure
Oxygen Supply Failure
Tidal Volume out of Bounds
Alarm Boundary Setting
600ml
500ml
300ml
400ml
Patient Feedback
Airway Pressure
Tidal Volume
Delivered (ml)
Ventilation
STOP
START
Inspiration
Expiration
WARNING
Set PEEP valve on top of device
Respiratory Settings
Read Instructions for Use
Set Inspiratory Pressure
Set Respiratory Rate
Set I:E Ratio
Set Oxygen
100%
58%
40%
Connect Oxygen
Connect Air
Set Breathing Mode
Set Inspiration Trigger Pressure
VELOCI-VENT™

系统



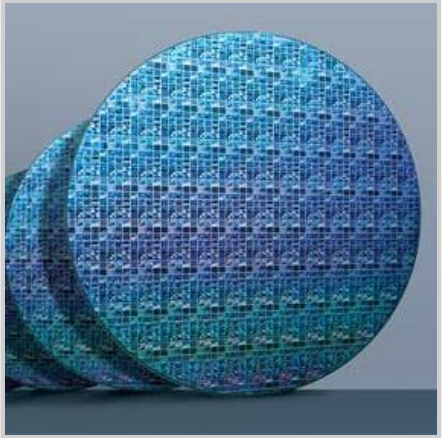
软件

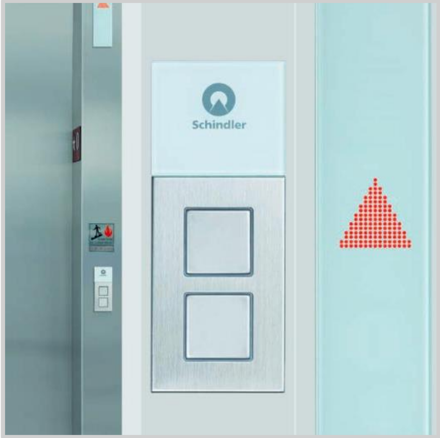
物理

```
bool writeWithWriter(const PosType* data, std::string participantName, std::string w
    DDS_DataWriter* writer = getWriter(writerName, participantName);
    PosTypeDataWriter* fooWriter = PosTypeDataWriter_narrow(writer);
    if(!fooWriter) {
        return false;
    }
    const DDS_ReturnCode_t ret = PosTypeDataWriter_write((PosTypeDataWriter*)writer,
    return (ret == DDS_ReturnCode_t::DDS_RETCODE_OK);
};
bool createParticipant(std::string participantName) {
    if (participants.find(participantName) == participants.end()) {
        DDS_DomainParticipant* participant =
            DDS_DomainParticipantFactory_create_participant_from_config(
            DDS_TheParticipantFactory, participantName.c_str());
        if(!participant) {
            return false;
        }
        participants[participantName] = participant;
    }
    return true;
```

组件


BMW Driving Experience




Schindler

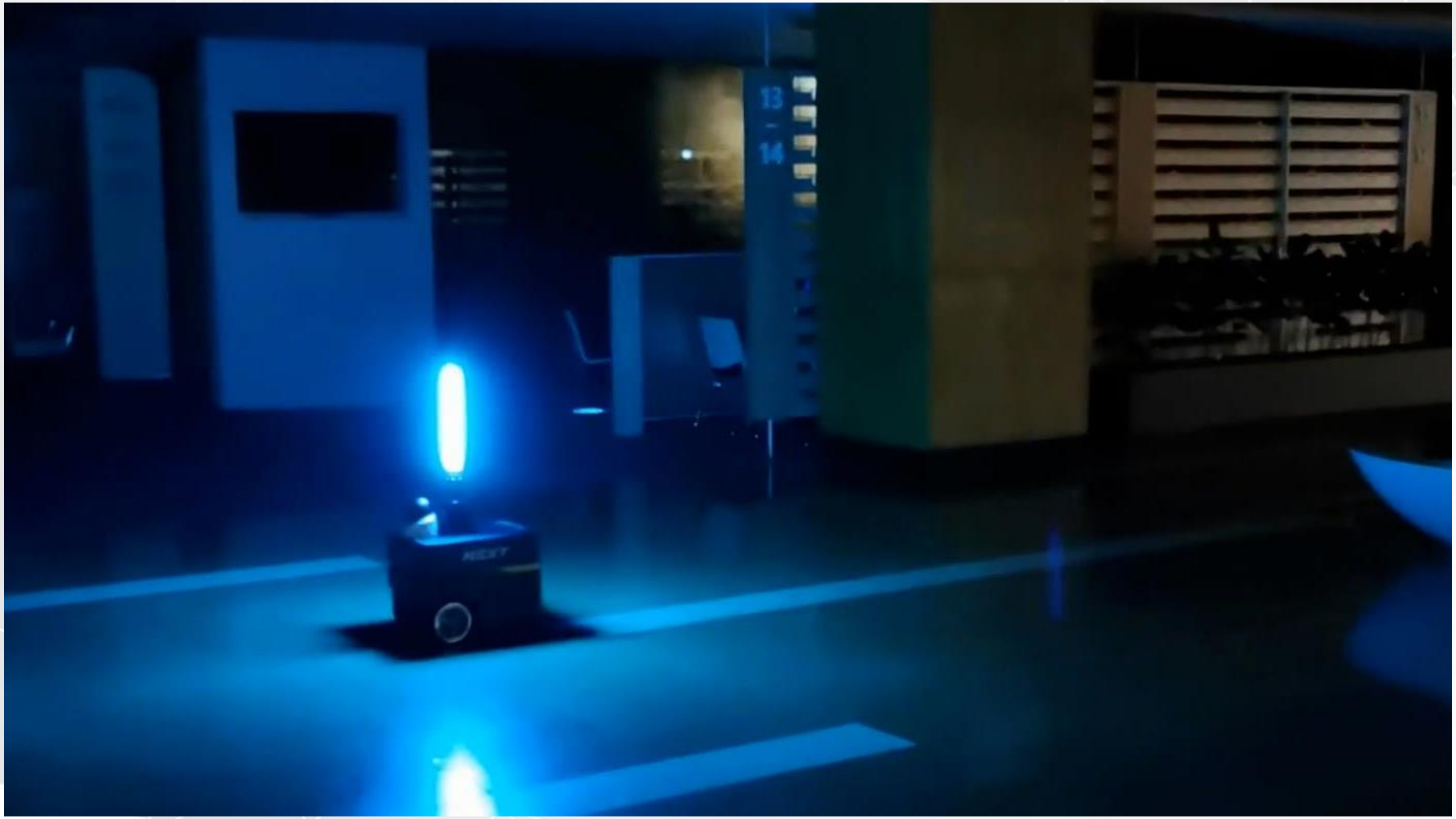
…自主或远程控制的消毒机器人拥有高性价比、可完成快速有效的消毒。”

—《科学•机器人学》 | 2020年3月25日


Singapore

Singapore

Singapore



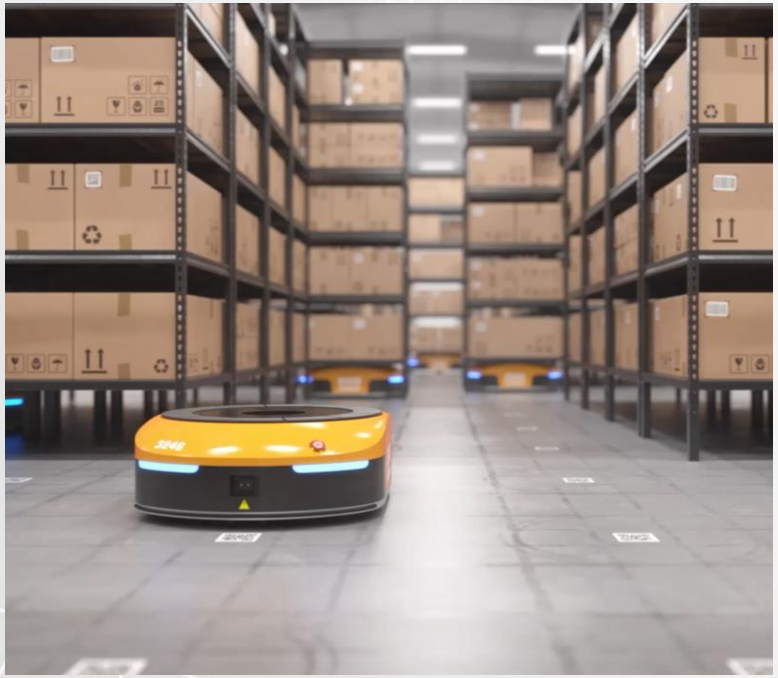
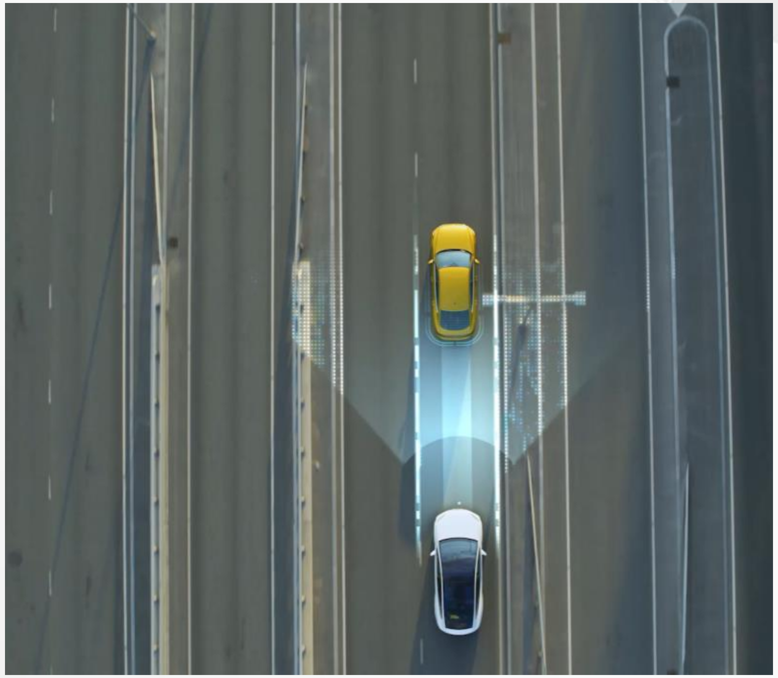
Singapore

Singapore

Singapore

“使用基于模型的设计方法，结合先进的工具，如Stateflow，机器人系统工具箱，以及代码生成系列产品，加快了设计机器人原型的步伐。”

—张延亮博士，Weston Robot公司董事总经理首席科学家



VOYAGE


AED


ALTAEROS

由于冠状病毒，美国各地的学院和大学都取消了面对面授课

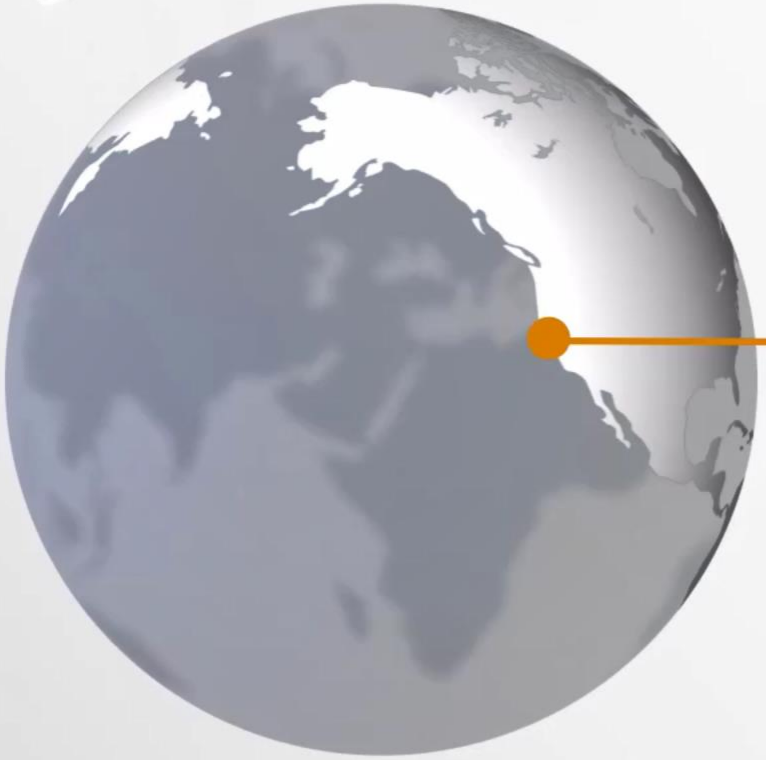
—*CNN* | 2020年3月12日

新冠肺炎疫情爆发，北京学校停课

—*纽约时报* | 2020年6月15日

由于新冠病例增加，韩国关闭了首尔的学校

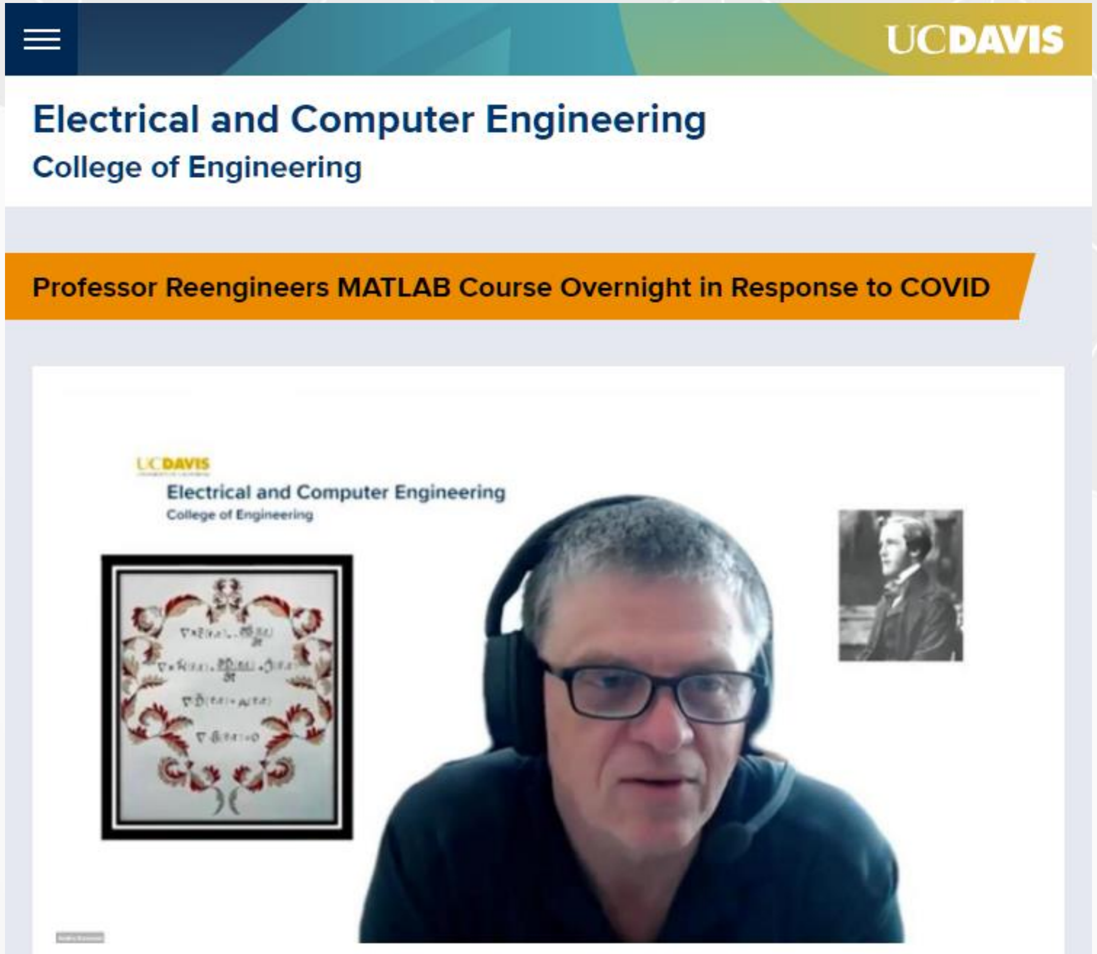
—*BBC* | 2020年8月25日



Davis, CA, United States

Davis, CA, United States

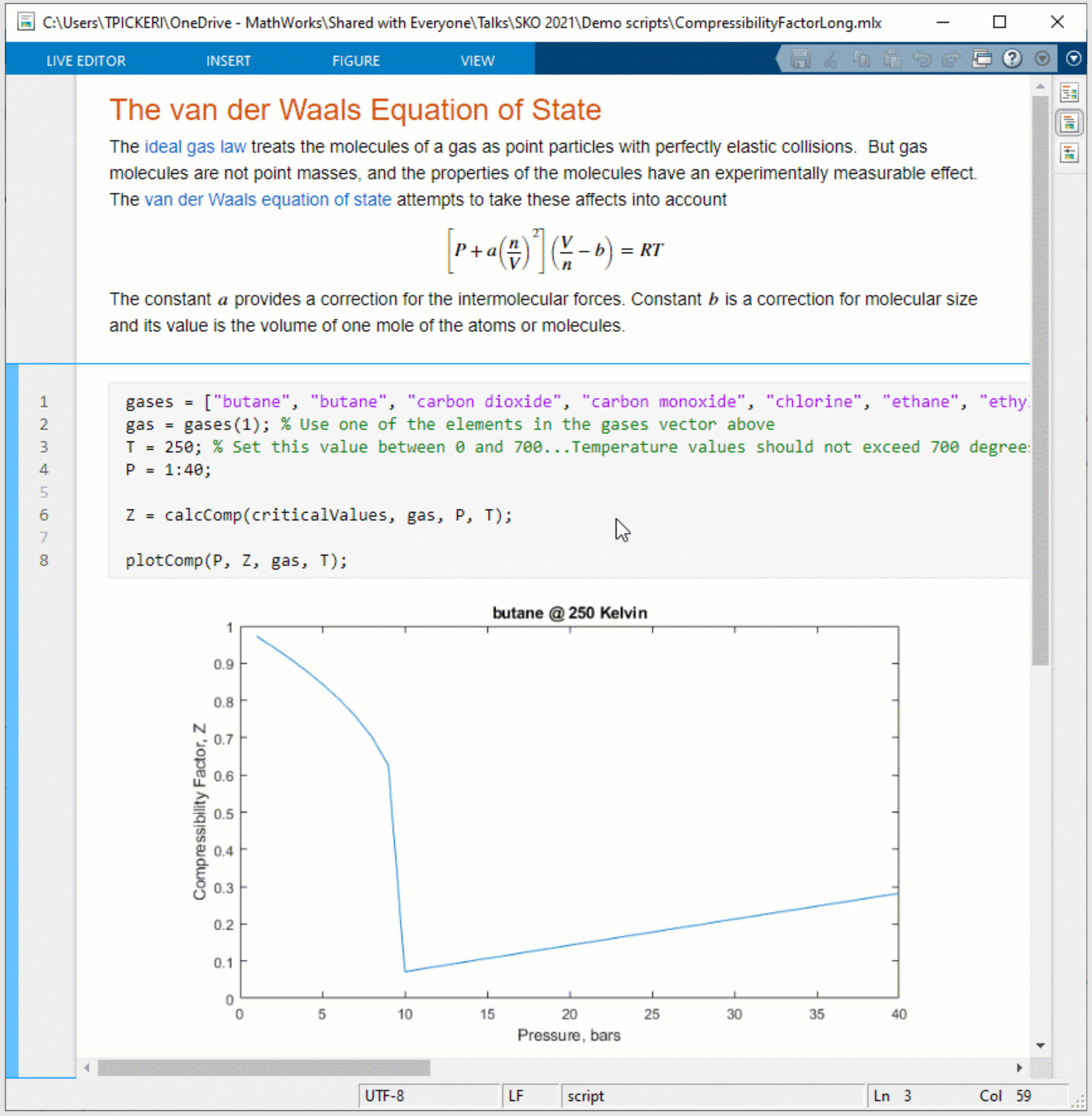
Dr. André Knoesen
University of California, Davis



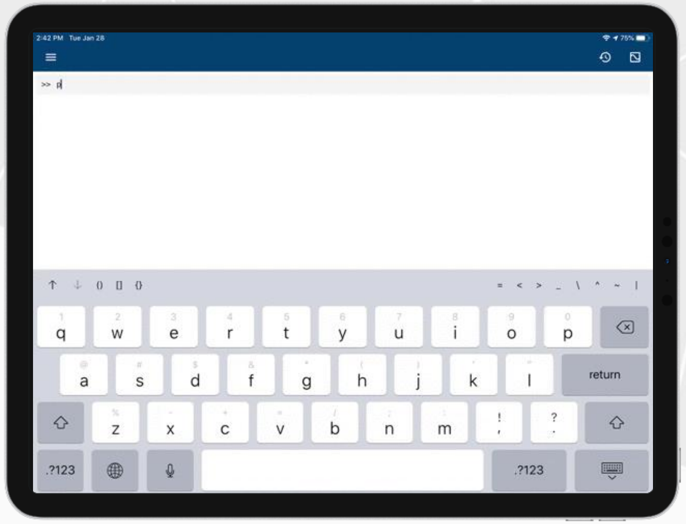
Professor Knoesen teaching Introduction to Problem Solving over Zoom. Image credit: UC Davis


Introduction to MATLAB
Powered by MATLAB®
Function definition: Volume of a pyramid
Your Function

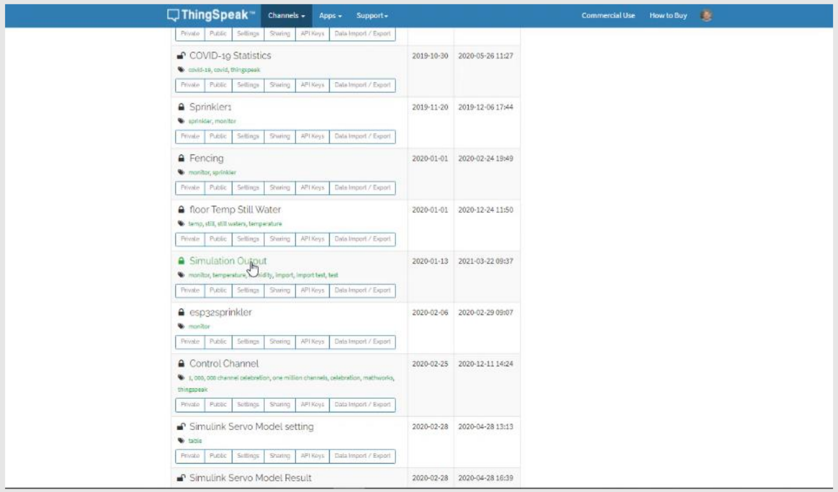
Live Editor



MATLAB Mobile



ThingSpeak



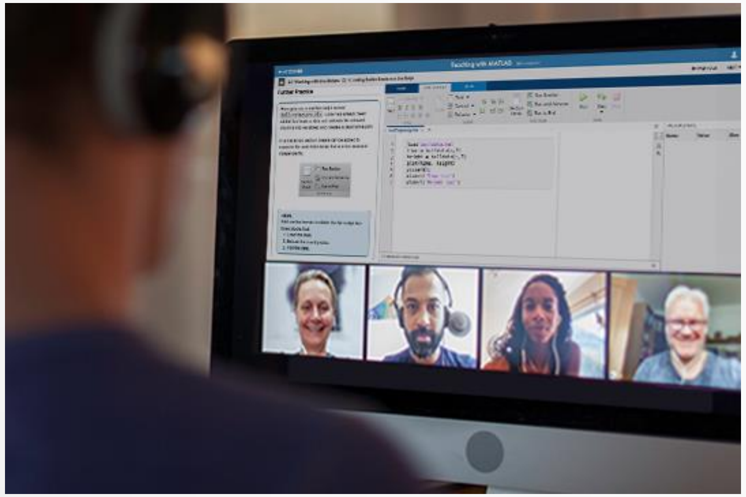
“要不是zyBook以及MATLAB的交互式结构早已就位，我们的转型会困难得多。我想说几乎不可能。”

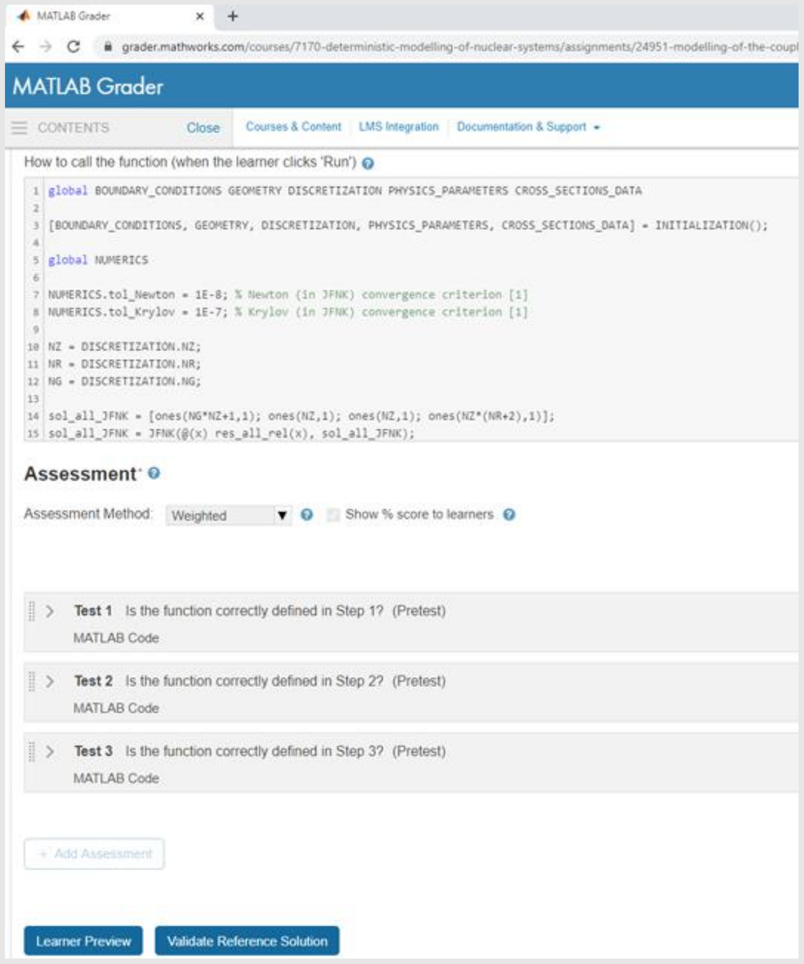
— André Knoesen博士
加州大学戴维斯分校电气与计算机工程系教授

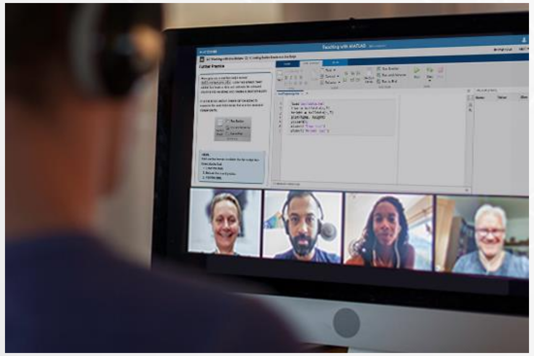

Gothenburg, Sweden

Gothenburg, Sweden

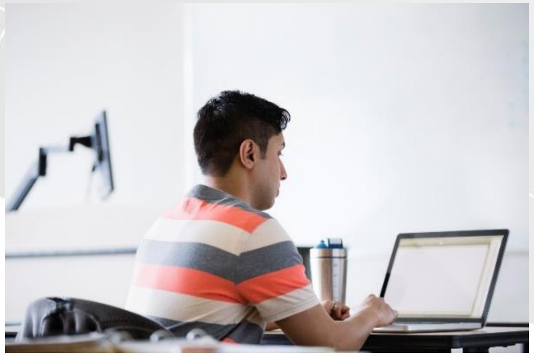
Dr. Christophe Demazière
Chalmers University of Technology

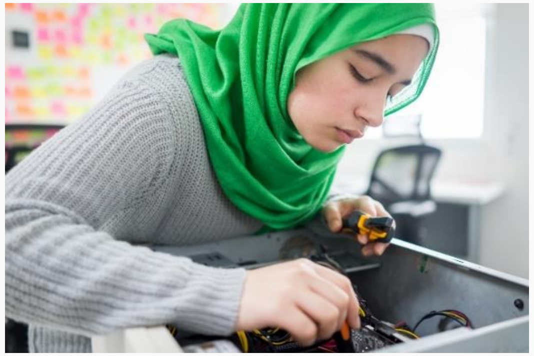




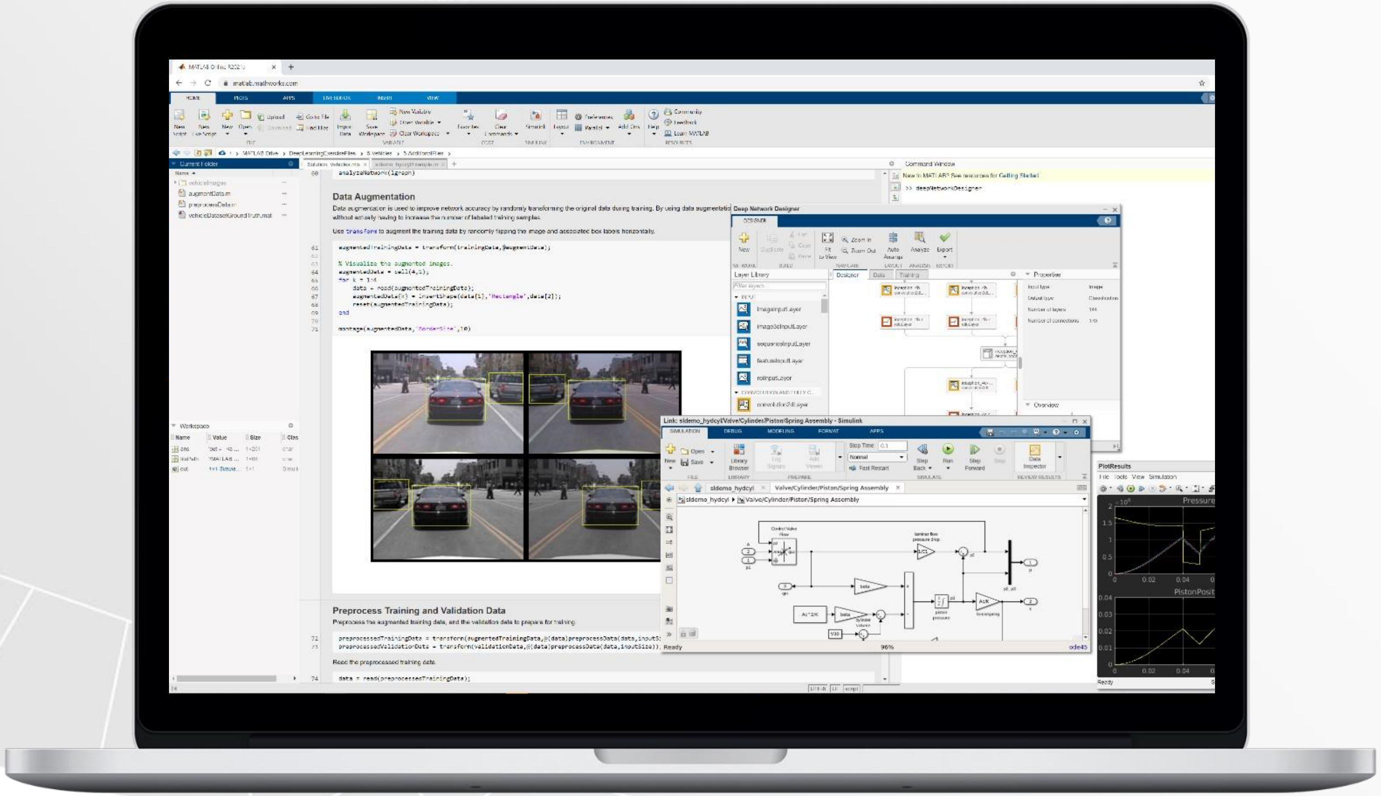


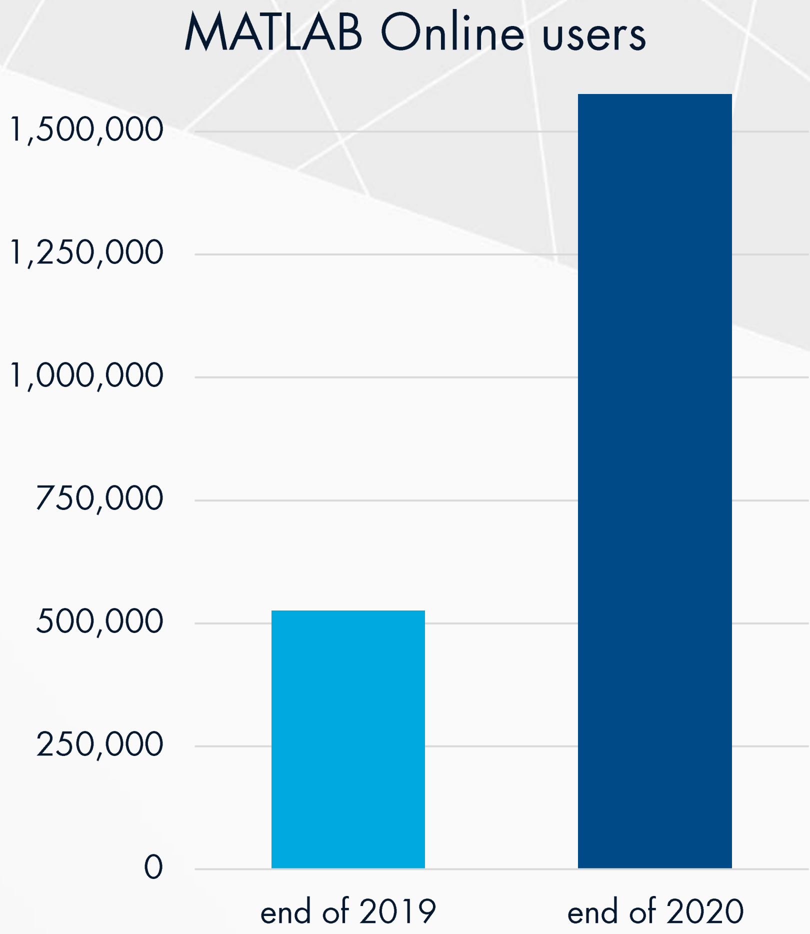
2300 所大学
为600万以上的学生提供服务





增长3倍，达到150万用户!



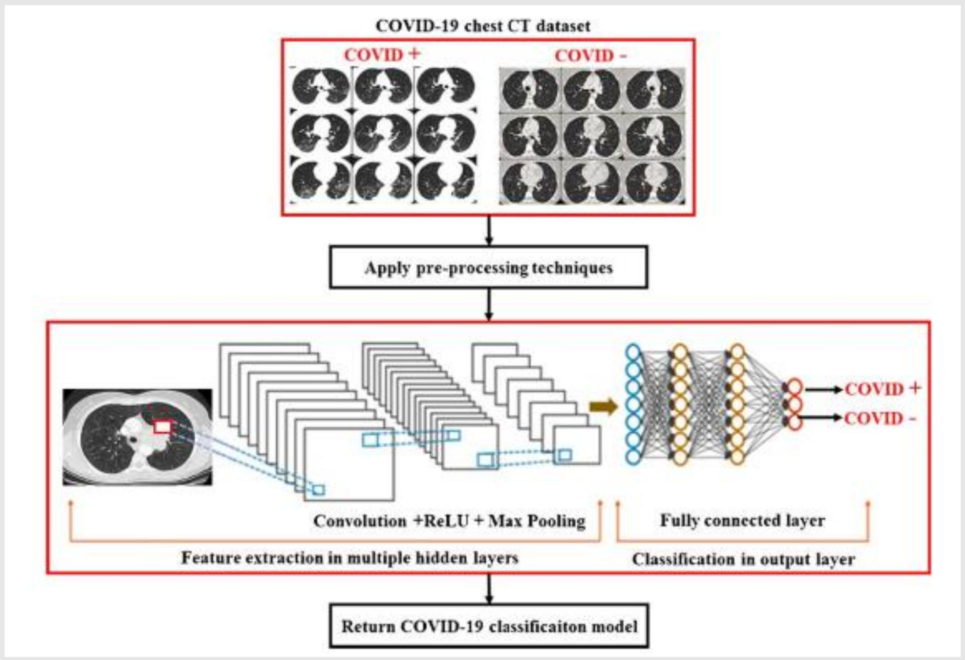



Learning Solutions
12224
Hide 3D cursor
Save Screen
Save
Display Properties
Annotations
Trace
Mouse Modes
Enlarge
Reset pointer
Full Annotation
Custom Annotation
User Graphics
MIP
Average
MinIP
Window Width & Level
Presets
Custom
Exit


Hamirpur & Jaipur, India

Hamirpur, India

Dr. Vijay Kumar
National Institute
of Technology



Jaipur, India

Dr. Manjit Kaur
Manipal University

Dr. Dilbag Singh
Manipal University

Dr. Vaishali Yadav
Manipal University

	Actual COVID-19 =Yes (+)	Actual COVID-19 =Yes (-)
Predicted COVID-19 = Yes (+)	True Positive TP=62±4	False Positive FP=7±3
Predicted COVID-19 = Yes (-)	False Negative FN=6±5	True Negative TN=58±6

与其它模型比较

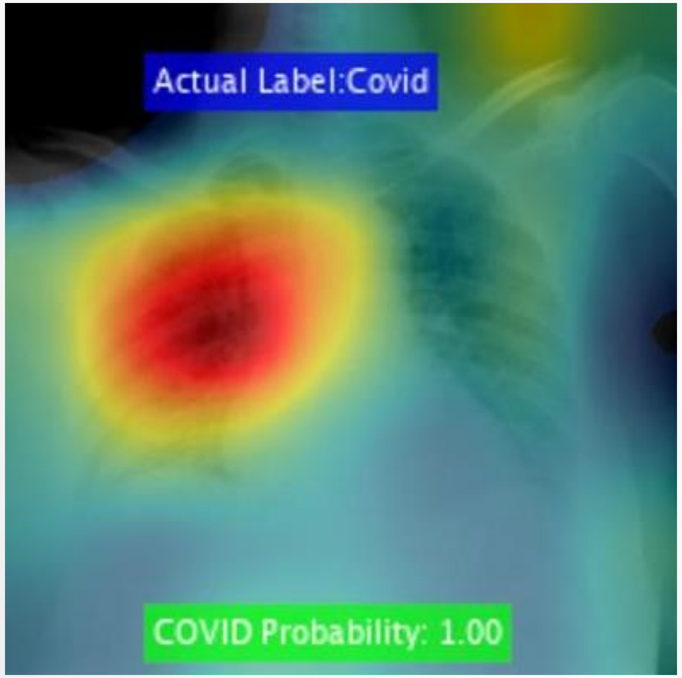
更高

更低

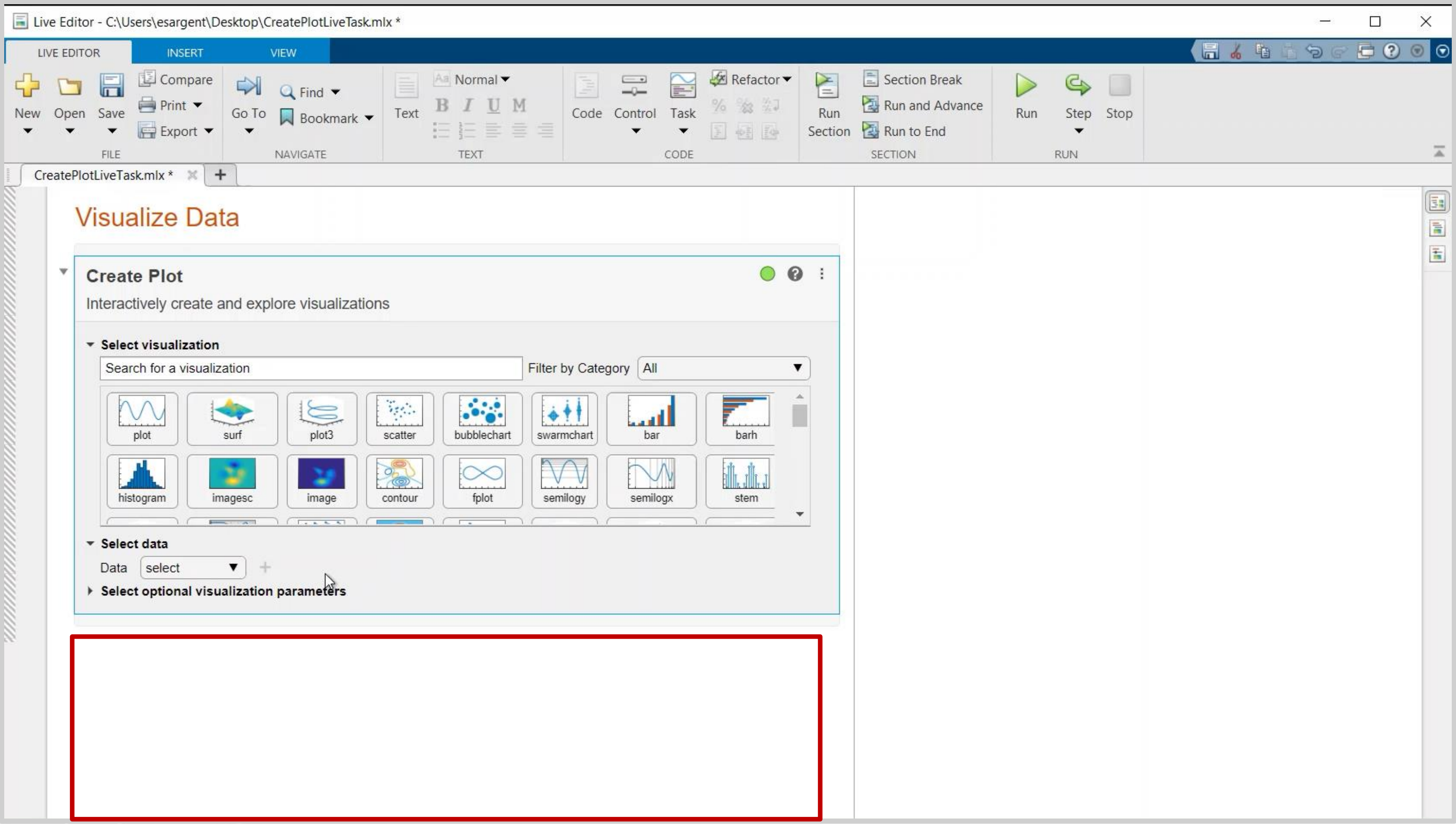

Dayton, OH, United States

Dayton, OH, United States

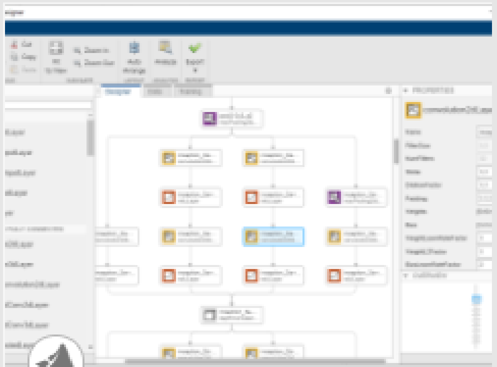
Dr. Barath Narayanan
University of Dayton



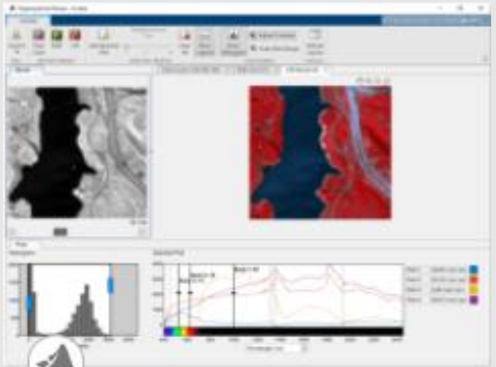
“使用MATLAB研发深度学习有助于快速构建原型和开发算法。”


Live Editor - C:\Users\esargent\Desktop\CreatePlotLiveTask.mlx *
LIVE EDITOR
INSERT
VIEW
New
Open
Save
Compare
Print
Export
FILE
Go To
Find
Bookmark
NAVIGATE
Text
Normal
TEXT
Code
Control
Task
Refactor
CODE
Run Section
Section Break
Run and Advance
Run to End
SECTION
Run
Step
Stop
RUN
CreatePlotLiveTask.mlx *
Visualize Data
Create Plot
Interactively create and explore visualizations
Select visualization
Search for a visualization
Filter by Category
All
plot
surf
plot3
scatter
bubblechart
swarmchart
bar
barh
histogram
imagesc
image
contour
fplot
semilogy
semilogx
stem
Select data
Data
select
Select optional visualization parameters

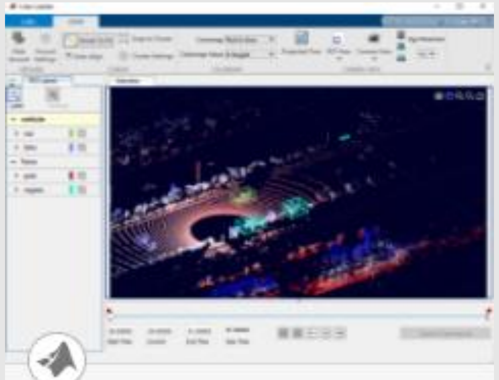
100+ apps 助力您轻松创建原型



Deep Network Designer

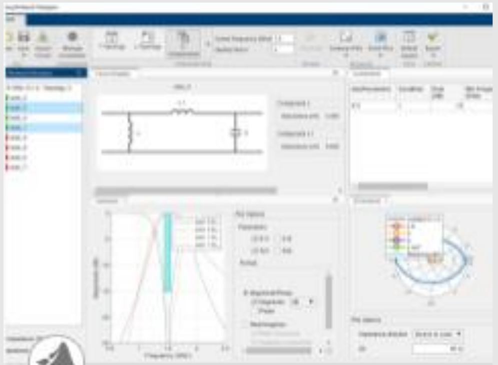


Hyperspectral Viewer

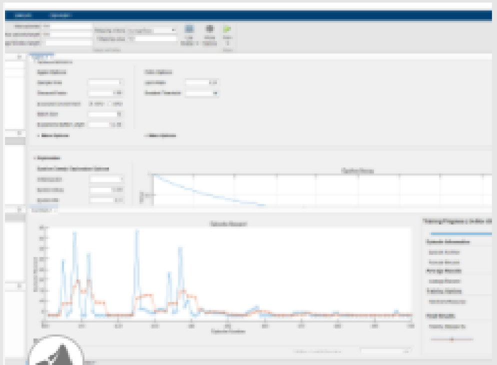


Lidar Labeler

Diagnostic Feature Designer



Matching Network Designer



Reinforcement Learning Designer

Cambridge, MA, United States

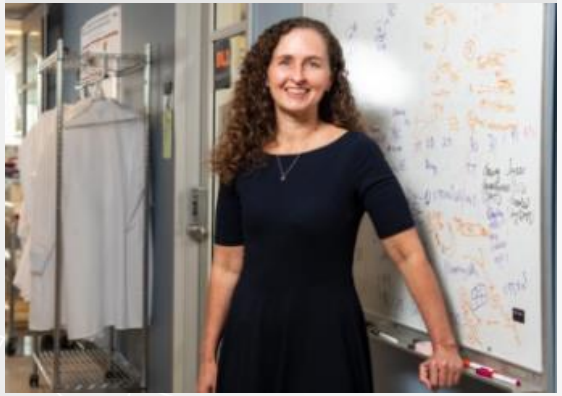
Cambridge, MA, United States

Dr. Hadley Sikes
Massachusetts Institute of Technology

3 Questions: Hadley Sikes on searching for a Covid-19 protein test

Chemical engineer aims to create a test that can work in 10 minutes and doesn't require specialized instruments or laboratory infrastructure.

— ***MIT News***




Shanghai, China

Shanghai, China

EClinicalMedicine
Published by THE LANCET

Cerebral Micro-Structural Changes in COVID-19 Patients
An MRI-based 3-month Follow-up Study

RESEARCH PAPER | 03 AUGUST 2020


1984/07/16
Age 22
SAG T1
2017/01/10 08:11:45
LOC:-43.99
THK5
SP6.75
HFS
ED:1
SE
FA90
TR550
TE12
ACQ:192\256
1 of 3
Z:0.57
C:589
W:1213
IM5 SE5
SAG T1
2017/01/10 08:11:45
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THK5
SP6.75
HFS
Z:0.57
C:520
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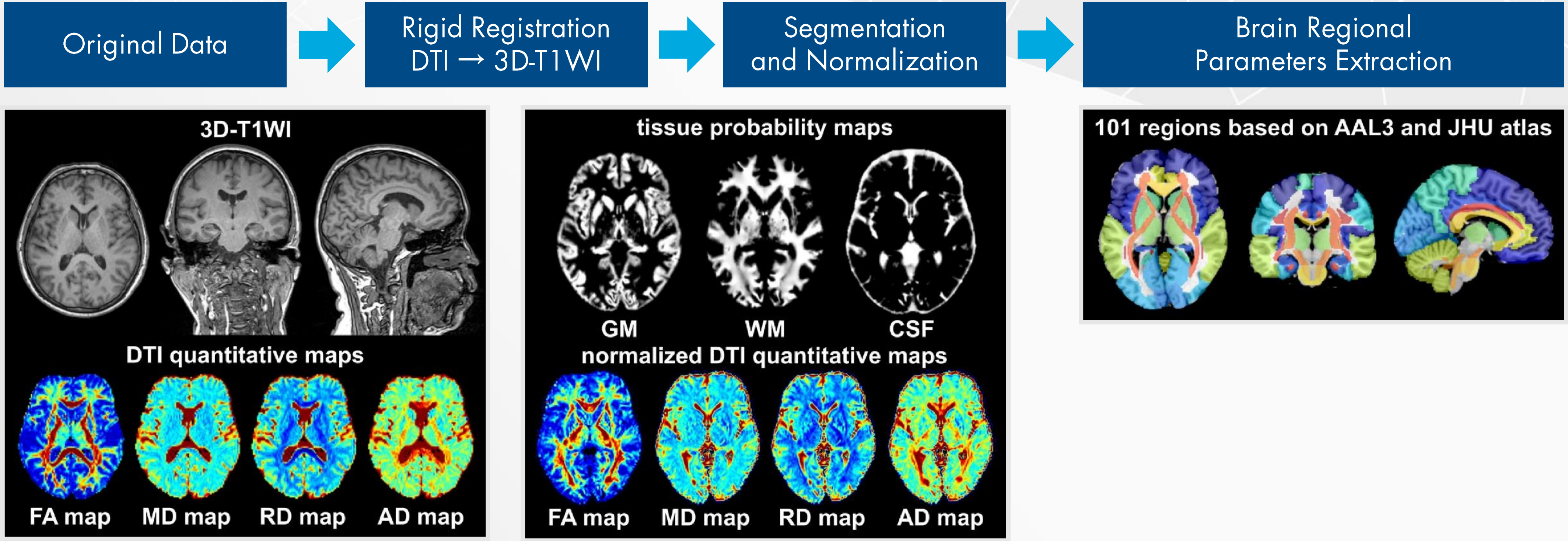
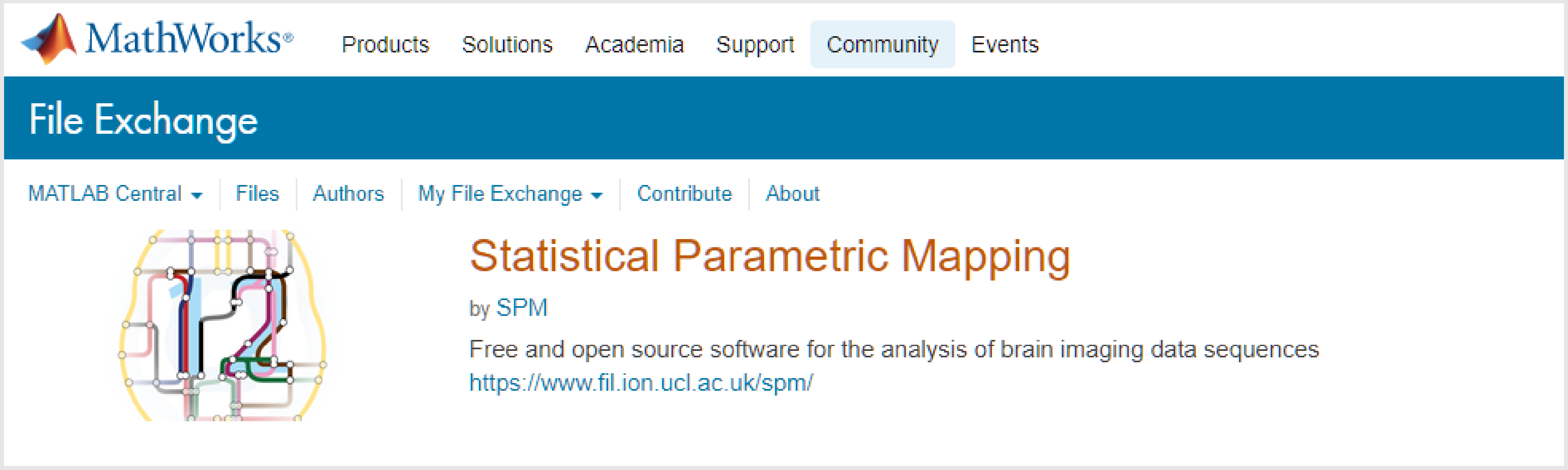
IM8 SE5
DIFFUSION_ADC


Original Data
Rigid Registration DTI → 3D-T1WI
Segmentation and Normalization
Brain Regional Parameters Extraction
3D-T1WI
DTI quantitative maps
FA map
MD map
RD map
AD map
tissue probability maps
GM
WM
CSF
normalized DTI quantitative maps
FA map
MD map
RD map
AD map
101 regions based on AAL3 and JHU atlas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About
Statistical Parametric Mapping
by SPM
Free and open source software for the analysis of brain imaging data sequences
https://www.fil.ion.ucl.ac.uk/spm/


STATISTICAL
PARAMETRIC
MAPPING
SPM
By members and collaborators of the Wellcome Centre for Human Neuroimaging

GitHub上有**数以千计的**社区开发的代码库

MATLAB

MATLAB is a high-performance language developed by MathWorks for technical computing, visualization, and programming. It is written in C, C++, Java and available for Windows, macOS, and Linux. Generally used by engineers and scientists in industry and academics for data analysis, signal processing, optimization and many other types of scientific computations.

MATLAB

MATLAB Schemer

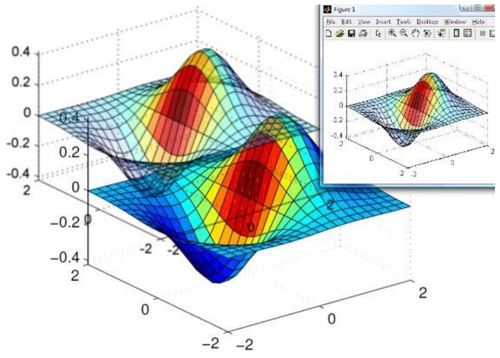
This MATLAB package makes it easy to change the color scheme (a.k.a. theme) of the MATLAB display and GUI.

```
function short_sample()
% Short syntax highlighting sample
global gbl_value;
gbl_value = 20
hghlghtvar = 'a_string_example_here';

%% Title of cell
badstring = 'unterminated_string;
unusedvar = hghlghtvar;
!echo "Example `!` system command"
for interval = 1:2:gbl_value
  % This is a very informative comment
  fprintf('%s:%d\n',hghlghtvar,interval);
end
end
```

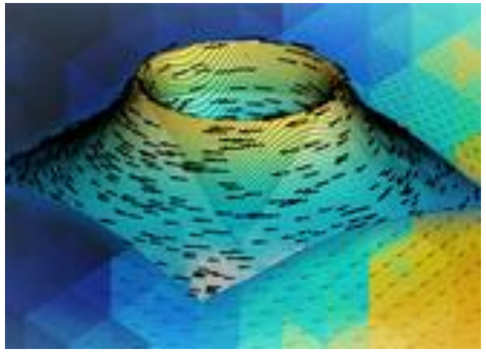
export_fig

A toolbox for exporting figures from MATLAB to standard image and document formats nicely.



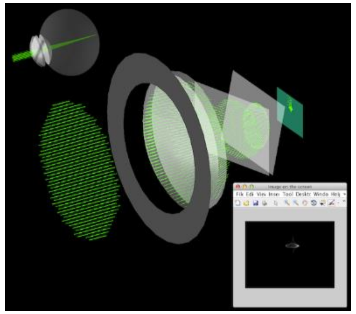
PIVLab

Particle Image Velocimetry for MATLAB, official repository



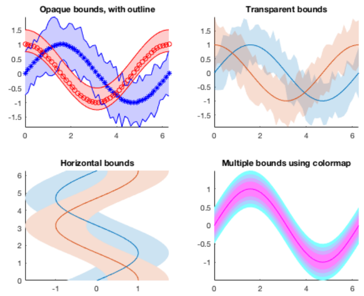
Optometrika

Optometrika MATLAB library implements analytical and iterative ray tracing approximation to optical image formation using Snell's and Fresnel's laws of refraction and reflection.



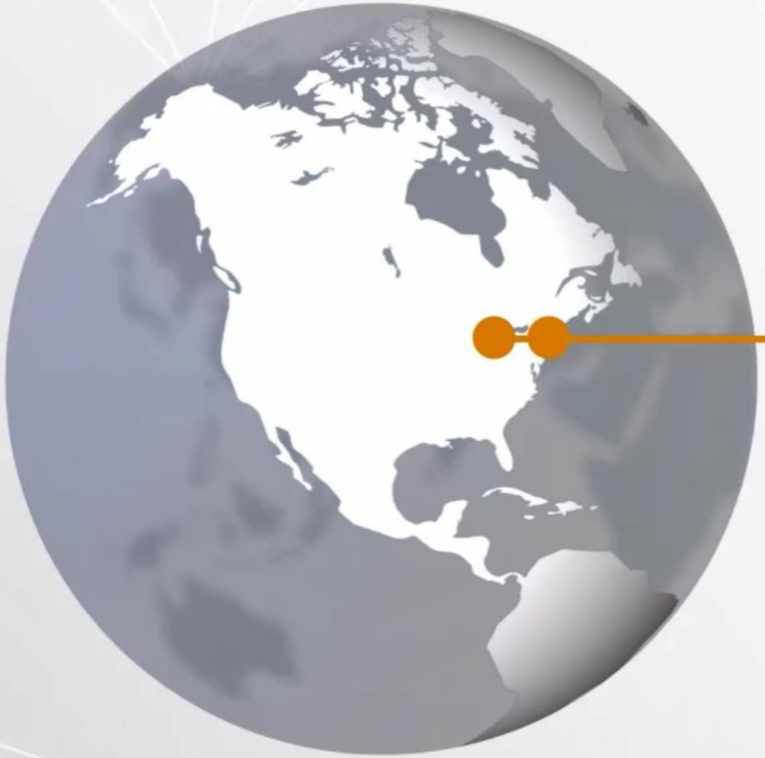
boundedline.m

This repository includes the code for the boundedline.m MATLAB function and the accompanying outlinebounds.m function, along with all dependent functions required to run them.



以及更多……


80WSE Gallery
NYU

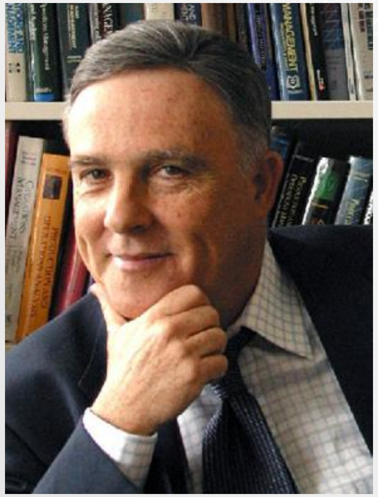


Toronto, CA

Cambridge, MA, United States

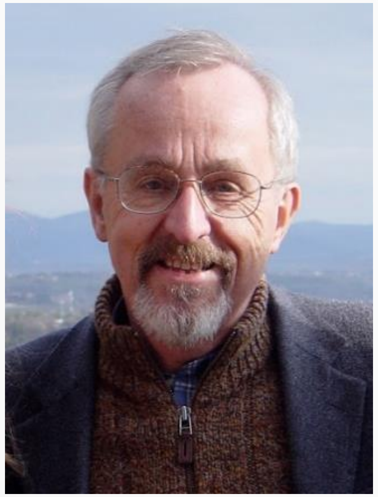
Toronto, Canada

Cambridge, MA

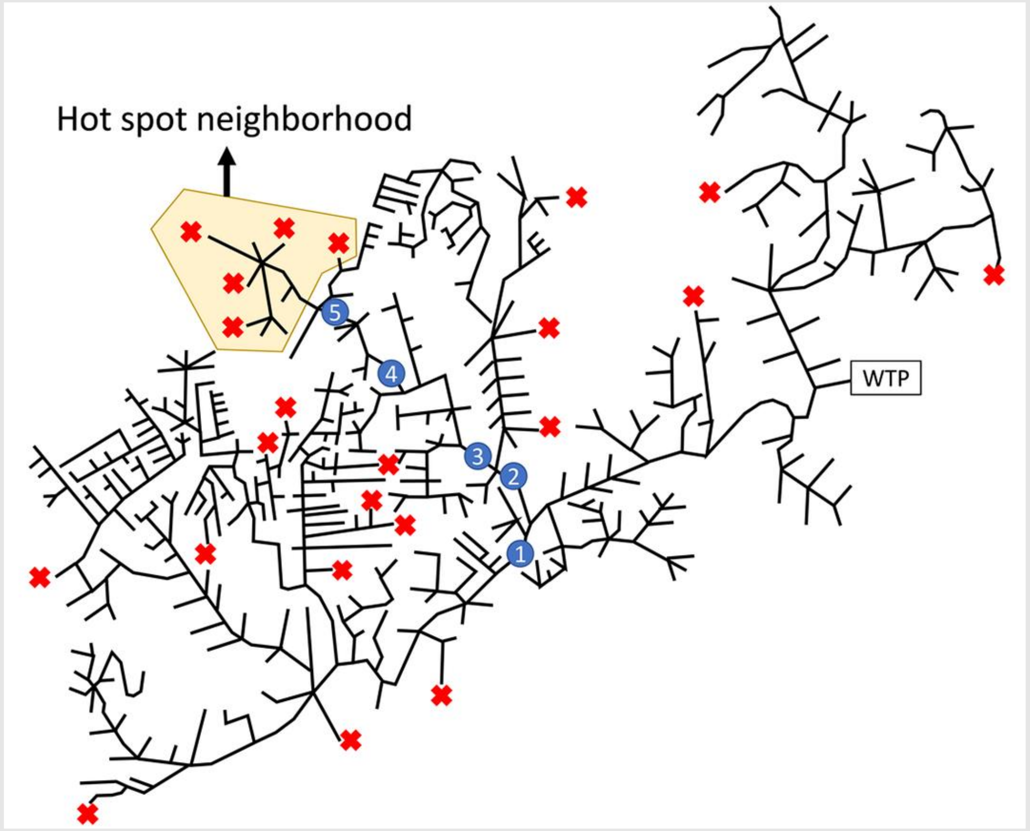


Dr. Oded Berman
University of Toronto

Dr. Mehdi Nourinejad
York University



Dr. Richard C. Larson
Massachusetts Institute of Technology


Hot spot neighborhood
WTP
1
2
3
4
5

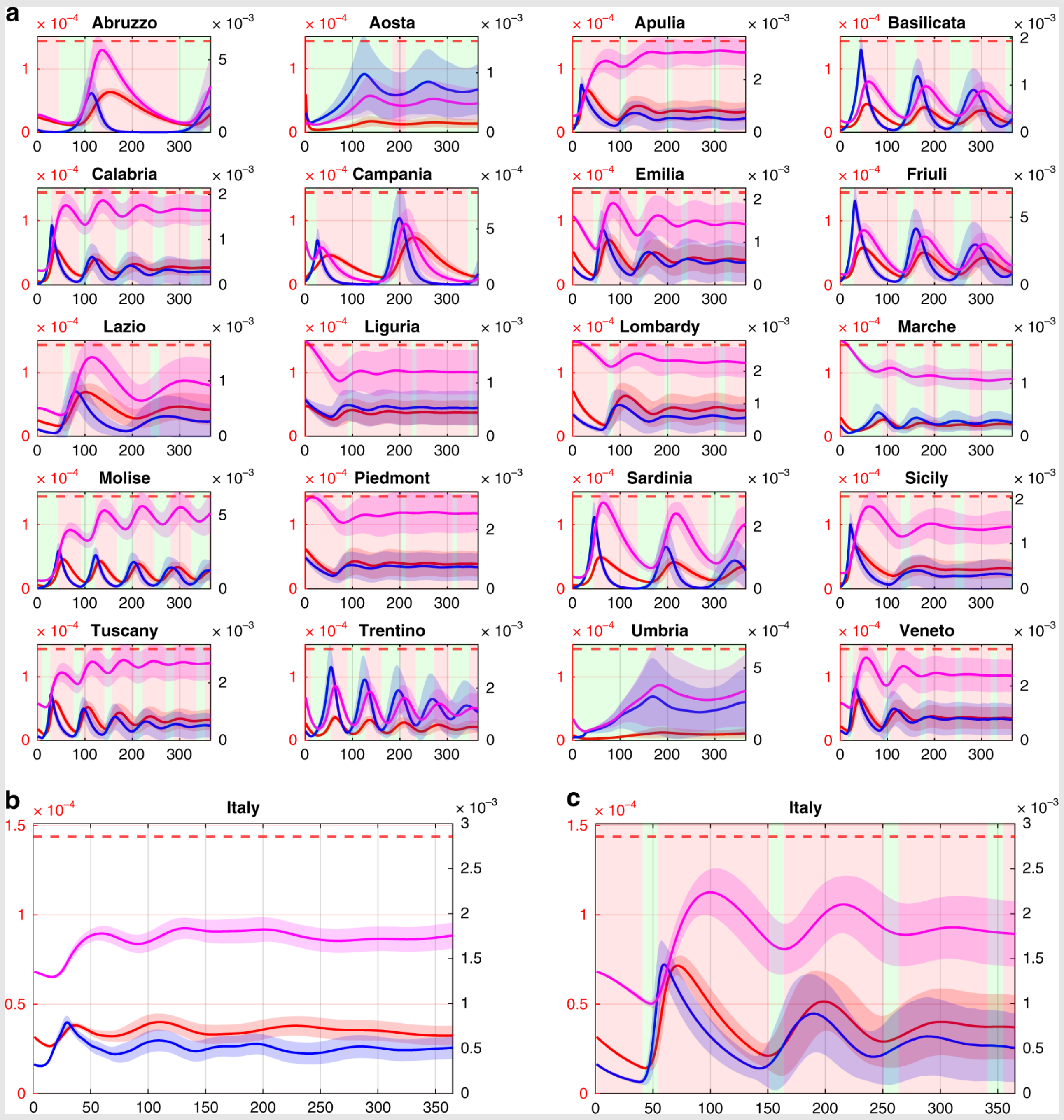

WTP
1
2
3
4
5
6
7


Naples, Italy

Naples, Italy

Dr. Mario di Bernardo
University of Naples

Naples, Italy



RNA 和 DNA 疫苗

病毒载体疫苗

重组蛋白

减毒活疫苗和灭活疫苗

水疱性口炎病毒（rVSV）复制疫苗


Ness Ziona, Israel

Ness Ziona, Israel

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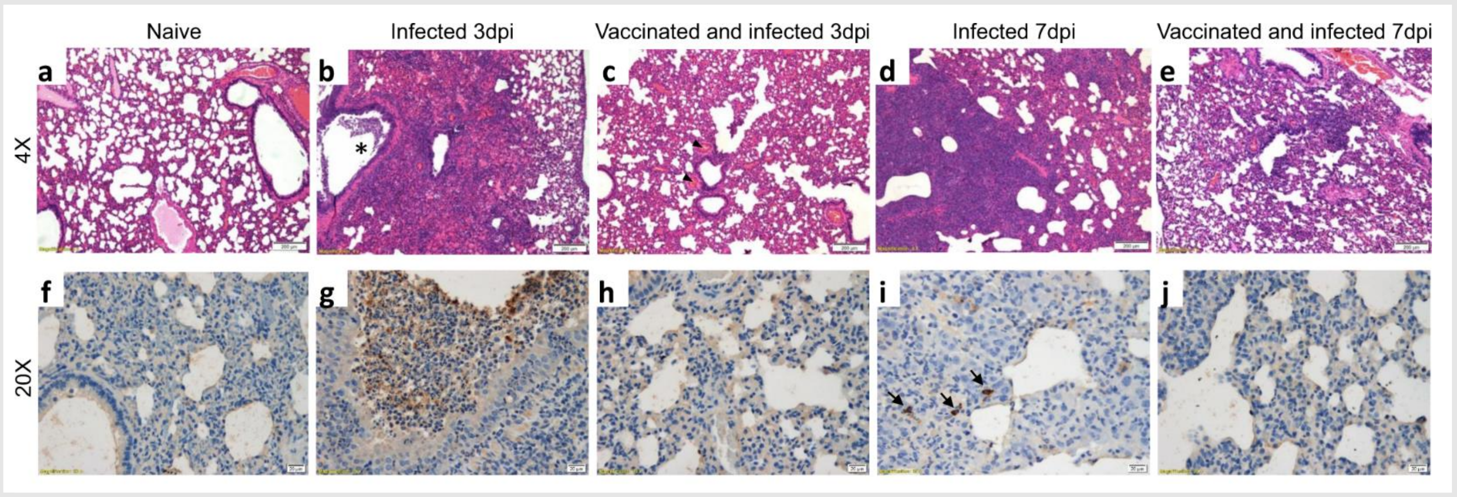
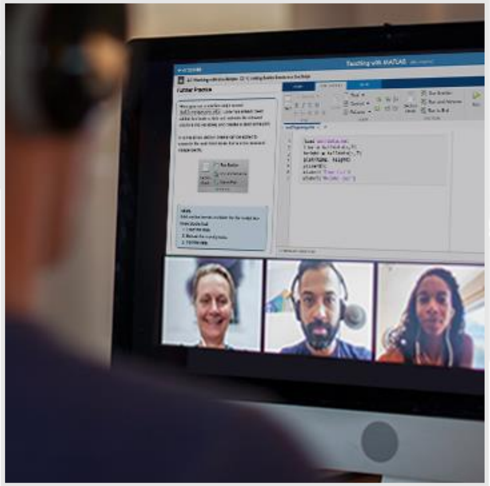
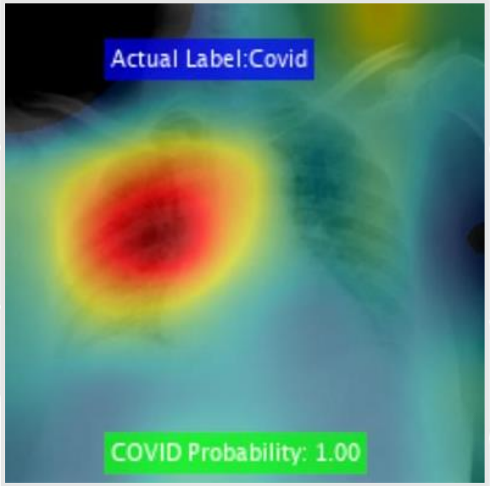


医疗设备

消毒机器人



远程学习



影像诊断

快检试纸

检测算法

疫苗研制

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