

Below is the operating system and hardware specifications used to run codes in this manuscript.

PYTHON Image Processing Codes

Linux ens13487 4.15.0-166-generic #174-Ubuntu SMP Wed Dec 8 19:07:44
UTC 2021 x86_64 x86_64 x86_64 GNU/Linux

Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 32
On-line CPU(s) list: 0-31
Thread(s) per core: 2
Core(s) per socket: 16
Socket(s): 1
NUMA node(s): 2s
Vendor ID: AuthenticAMD
CPU family: 23
Model: 8
Model name: AMD Ryzen Threadripper 2950X 16-Core Processor
Stepping: 2
CPU MHz: 1893.365
CPU max MHz: 3500.0000
CPU min MHz: 2200.0000
BogoMIPS: 6986.34
Virtualization: AMD-V
L1d cache: 32K
L1i cache: 64K
L2 cache: 512K
L3 cache: 8192K
NUMA node0 CPU(s): 0-15
NUMA node1 CPU(s): 16-31
Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr
pge mca cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext
fxsr_opt pdpe1gb rdtscp lm constant_tsc rep_good nopl nonstop_tsc
cpuid extd_apicid amd_dcm aperfmperf pni pclmulqdq monitor ssse3 fma
cx16 sse4_1 sse4_2 movbe popcnt aes xsave avx f16c rdrand lahf_lm
cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch
osvw skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr_llc
mwaitx cpb hw_pstate sme ssbd ibpb vmcall fsgsbase bmi1 avx2 smep
bmi2 rdseed adx smap clflushopt sha_ni xsaveopt xsavec xgetbv1 xsaves
clzero irperf xsaveerptr arat npt lbrv svm_lock nrip_save tsc_scale
vmcb_clean flushbyasid decodeassists pausefilter pfthreshold avic
v_vmsave_vmload vgif overflow_recov succor smca

00:00.0 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) Root Complex

00:00.2 IOMMU: Advanced Micro Devices, Inc. [AMD] Family 17h (Models

00h-0fh) I/O Memory Management Unit
00:01.0 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) PCIe Dummy Host Bridge
00:01.1 PCI bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) PCIe GPP Bridge
00:02.0 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) PCIe Dummy Host Bridge
00:03.0 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) PCIe Dummy Host Bridge
00:03.1 PCI bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) PCIe GPP Bridge
00:04.0 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) PCIe Dummy Host Bridge
00:07.0 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) PCIe Dummy Host Bridge
00:07.1 PCI bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) Internal PCIe GPP Bridge 0 to Bus B
00:08.0 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) PCIe Dummy Host Bridge
00:08.1 PCI bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) Internal PCIe GPP Bridge 0 to Bus B
00:14.0 SMBus: Advanced Micro Devices, Inc. [AMD] FCH SMBus Controller
(rev 59)
00:14.3 ISA bridge: Advanced Micro Devices, Inc. [AMD] FCH LPC Bridge
(rev 51)
00:18.0 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) Data Fabric: Device 18h; Function 0
00:18.1 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) Data Fabric: Device 18h; Function 1
00:18.2 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) Data Fabric: Device 18h; Function 2
00:18.3 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) Data Fabric: Device 18h; Function 3
00:18.4 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) Data Fabric: Device 18h; Function 4
00:18.5 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) Data Fabric: Device 18h; Function 5
00:18.6 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) Data Fabric: Device 18h; Function 6
00:18.7 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) Data Fabric: Device 18h; Function 7
00:19.0 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) Data Fabric: Device 18h; Function 0
00:19.1 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) Data Fabric: Device 18h; Function 1
00:19.2 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) Data Fabric: Device 18h; Function 2
00:19.3 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) Data Fabric: Device 18h; Function 3
00:19.4 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h

(Models 00h-0fh) Data Fabric: Device 18h; Function 4
00:19.5 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) Data Fabric: Device 18h; Function 5
00:19.6 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) Data Fabric: Device 18h; Function 6
00:19.7 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) Data Fabric: Device 18h; Function 7
01:00.0 USB controller: Advanced Micro Devices, Inc. [AMD] X399 Series
Chipset USB 3.1 xHCI Controller (rev 02)
01:00.1 SATA controller: Advanced Micro Devices, Inc. [AMD] X399
Series Chipset SATA Controller (rev 02)
01:00.2 PCI bridge: Advanced Micro Devices, Inc. [AMD] X399 Series
Chipset PCIe Bridge (rev 02)
02:00.0 PCI bridge: Advanced Micro Devices, Inc. [AMD] 300 Series
Chipset PCIe Port (rev 02)
02:01.0 PCI bridge: Advanced Micro Devices, Inc. [AMD] 300 Series
Chipset PCIe Port (rev 02)
02:02.0 PCI bridge: Advanced Micro Devices, Inc. [AMD] 300 Series
Chipset PCIe Port (rev 02)
02:03.0 PCI bridge: Advanced Micro Devices, Inc. [AMD] 300 Series
Chipset PCIe Port (rev 02)
02:04.0 PCI bridge: Advanced Micro Devices, Inc. [AMD] 300 Series
Chipset PCIe Port (rev 02)
04:00.0 Ethernet controller: Intel Corporation I211 Gigabit Network
Connection (rev 03)
05:00.0 Network controller: Intel Corporation Wireless 8265 / 8275
(rev 78)
06:00.0 Ethernet controller: Intel Corporation I211 Gigabit Network
Connection (rev 03)
08:00.0 VGA compatible controller: NVIDIA Corporation Device 1f02 (rev
a1)
08:00.1 Audio device: NVIDIA Corporation Device 10f9 (rev a1)
08:00.2 USB controller: NVIDIA Corporation Device 1ada (rev a1)
08:00.3 Serial bus controller [0c80]: NVIDIA Corporation Device 1adb
(rev a1)
09:00.0 Non-Essential Instrumentation [1300]: Advanced Micro Devices,
Inc. [AMD] Device 145a
09:00.2 Encryption controller: Advanced Micro Devices, Inc. [AMD]
Family 17h (Models 00h-0fh) Platform Security Processor
09:00.3 USB controller: Advanced Micro Devices, Inc. [AMD] USB 3.0
Host controller
0a:00.0 Non-Essential Instrumentation [1300]: Advanced Micro Devices,
Inc. [AMD] Device 1455
0a:00.2 SATA controller: Advanced Micro Devices, Inc. [AMD] FCH SATA
Controller [AHCI mode] (rev 51)
0a:00.3 Audio device: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) HD Audio Controller
40:00.0 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h
(Models 00h-0fh) Root Complex
40:00.2 IOMMU: Advanced Micro Devices, Inc. [AMD] Family 17h (Models

00h-0fh) I/O Memory Management Unit
40:01.0 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h (Models 00h-0fh) PCIe Dummy Host Bridge
40:02.0 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h (Models 00h-0fh) PCIe Dummy Host Bridge
40:03.0 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h (Models 00h-0fh) PCIe Dummy Host Bridge
40:03.1 PCI bridge: Advanced Micro Devices, Inc. [AMD] Family 17h (Models 00h-0fh) PCIe GPP Bridge
40:04.0 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h (Models 00h-0fh) PCIe Dummy Host Bridge
40:07.0 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h (Models 00h-0fh) PCIe Dummy Host Bridge
40:07.1 PCI bridge: Advanced Micro Devices, Inc. [AMD] Family 17h (Models 00h-0fh) Internal PCIe GPP Bridge 0 to Bus B
40:08.0 Host bridge: Advanced Micro Devices, Inc. [AMD] Family 17h (Models 00h-0fh) PCIe Dummy Host Bridge
40:08.1 PCI bridge: Advanced Micro Devices, Inc. [AMD] Family 17h (Models 00h-0fh) Internal PCIe GPP Bridge 0 to Bus B
41:00.0 VGA compatible controller: NVIDIA Corporation Device 1f02 (rev a1)
41:00.1 Audio device: NVIDIA Corporation Device 10f9 (rev a1)
41:00.2 USB controller: NVIDIA Corporation Device 1ada (rev a1)
41:00.3 Serial bus controller [0c80]: NVIDIA Corporation Device 1adb (rev a1)
42:00.0 Non-Essential Instrumentation [1300]: Advanced Micro Devices, Inc. [AMD] Device 145a
42:00.2 Encryption controller: Advanced Micro Devices, Inc. [AMD] Family 17h (Models 00h-0fh) Platform Security Processor
42:00.3 USB controller: Advanced Micro Devices, Inc. [AMD] USB 3.0 Host controller
43:00.0 Non-Essential Instrumentation [1300]: Advanced Micro Devices, Inc. [AMD] Device 1455
43:00.2 SATA controller: Advanced Micro Devices, Inc. [AMD] FCH SATA Controller [AHCI mode] (rev 51)

For PYTHON FIM Codes (Figures 2-4, S1-S10)

Codes Tested on multiple devices:

DEVICE 1 (MacBook Pro Laptop with M1 chip)

Software:

System Software Overview:

System Version: macOS 13.3.1 (22E261)
Kernel Version: Darwin 22.4.0

Boot Volume: Macintosh HD
Boot Mode: Normal
Secure Virtual Memory: Enabled
System Integrity Protection: Enabled
Time since boot: 3 days, 6 hours, 52 minutes

Hardware:

Hardware Overview:

Model Name: MacBook Pro
Model Identifier: MacBookPro17,1
Model Number: Z11C000E4LL/A
Chip: Apple M1
Total Number of Cores: 8 (4 performance and 4 efficiency)
Memory: 16 GB
System Firmware Version: 8422.100.650
OS Loader Version: 8422.100.650

DEVICE 2 (Rocky Linux Cluster):

Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 12
On-line CPU(s) list: 0-11
Thread(s) per core: 1
Core(s) per socket: 6
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 63
Model name: Intel(R) Xeon(R) CPU E5-2620 v3 @ 2.40GHz
Stepping: 2
CPU MHz: 3200.000
CPU max MHz: 3200.0000
CPU min MHz: 1200.0000
BogoMIPS: 4800.45
L1d cache: 32K
L1i cache: 32K
L2 cache: 256K
L3 cache: 15360K
NUMA node0 CPU(s): 0-5
NUMA node1 CPU(s): 6-11

NAME="Rocky Linux"
VERSION="8.7 (Green Obsidian)"
ID="rocky"

```
ID_LIKE="rhel centos fedora"
VERSION_ID="8.7"
PLATFORM_ID="platform:el8"
PRETTY_NAME="Rocky Linux 8.7 (Green Obsidian)"
ANSI_COLOR="0;32"
LOGO="fedora-logo-icon"
CPE_NAME="cpe:/o:rocky:rocky:8:GA"
HOME_URL="https://rockylinux.org/"
BUG_REPORT_URL="https://bugs.rockylinux.org/"
ROCKY_SUPPORT_PRODUCT="Rocky-Linux-8"
ROCKY_SUPPORT_PRODUCT_VERSION="8.7"
REDHAT_SUPPORT_PRODUCT="Rocky Linux"
REDHAT_SUPPORT_PRODUCT_VERSION="8.7"
```

For MATLAB Codes (Figures 5–8, S11, S12)

Codes Tested on multiple devices:

DEVICE 1 (MacBook Pro Laptop):
Hardware:

Hardware Overview:

```
Model Name: MacBook Pro
Model Identifier: MacBookPro14,3
Processor Name: Quad-Core Intel Core i7
Processor Speed: 2.9 GHz
Number of Processors: 1
Total Number of Cores: 4
L2 Cache (per Core): 256 KB
L3 Cache: 8 MB
Hyper-Threading Technology: Enabled
Memory: 16 GB
System Firmware Version: 499.40.2.0.0
OS Loader Version: 540.120.3~22
SMC Version (system): 2.45f5
```

Software:

System Software Overview:

```
System Version: macOS 12.6.3 (21G419)
Kernel Version: Darwin 21.6.0
Boot Mode: Normal
Secure Virtual Memory: Enabled
System Integrity Protection: Enabled
```

DEVICE 2 (Rocky Linux Cluster):

Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 12
On-line CPU(s) list: 0-11
Thread(s) per core: 1
Core(s) per socket: 6
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 63
Model name: Intel(R) Xeon(R) CPU E5-2620 v3 @ 2.40GHz
Stepping: 2
CPU MHz: 3200.000
CPU max MHz: 3200.0000
CPU min MHz: 1200.0000
BogoMIPS: 4800.45
L1d cache: 32K
L1i cache: 32K
L2 cache: 256K
L3 cache: 15360K
NUMA node0 CPU(s): 0-5
NUMA node1 CPU(s): 6-11

NAME="Rocky Linux"
VERSION="8.7 (Green Obsidian)"
ID="rocky"
ID_LIKE="rhel centos fedora"
VERSION_ID="8.7"
PLATFORM_ID="platform:el8"
PRETTY_NAME="Rocky Linux 8.7 (Green Obsidian)"
ANSI_COLOR="0;32"
LOGO="fedora-logo-icon"
CPE_NAME="cpe:/o:rocky:rocky:8:GA"
HOME_URL="https://rockylinux.org/"
BUG_REPORT_URL="https://bugs.rockylinux.org/"
ROCKY_SUPPORT_PRODUCT="Rocky-Linux-8"
ROCKY_SUPPORT_PRODUCT_VERSION="8.7"
REDHAT_SUPPORT_PRODUCT="Rocky Linux"
REDHAT_SUPPORT_PRODUCT_VERSION="8.7"

MATLAB Scripts have been tested on multiple versions.

MATLAB Scripts tested on Versions R2021b, R2022b, and R2023a.
Version Information provided below:

MATLAB Version: 9.11.0.2022996 (R2021b) Update 4
MATLAB License Number: 40638290
Operating System: macOS Version: 12.6.3 Build: 21G419
Java Version: Java 1.8.0_202-b08 with Oracle Corporation Java
HotSpot(TM) 64-Bit Server VM mixed mode

MATLAB (R2021b)	Version 9.11
Simulink (R2021b)	Version 10.4
5G Toolbox (R2021b)	Version 2.3
AUTOSAR Blockset (R2021b)	Version 2.5
Aerospace Blockset (R2021b)	Version 5.1
Aerospace Toolbox (R2021b)	Version 4.1
Antenna Toolbox (R2021b)	Version 5.1
Audio Toolbox (R2021b)	Version 3.1
Automated Driving Toolbox (R2021b)	Version 3.4
Bioinformatics Toolbox (R2021b)	Version 4.15.2
Communications Toolbox (R2021b)	Version 7.6
Computer Vision Toolbox (R2021b)	Version 10.1
Control System Toolbox (R2021b)	Version 10.11
Curve Fitting Toolbox (R2021b)	Version 3.6
DDS Blockset (R2021b)	Version 1.1
DSP System Toolbox (R2021b)	Version 9.13
Database Toolbox (R2021b)	Version 10.2
Datafeed Toolbox (R2021b)	Version 6.1
Deep Learning Toolbox (R2021b)	Version 14.3
Econometrics Toolbox (R2021b)	Version 5.7
Embedded Coder (R2021b)	Version 7.7
Filter Design HDL Coder	Version 3.1.10

(R2021b)	
Financial Instruments Toolbox	Version 3.3
(R2021b)	
Financial Toolbox	Version 6.2
(R2021b)	
Fixed-Point Designer	Version 7.3
(R2021b)	
Fuzzy Logic Toolbox	Version 2.8.2
(R2021b)	
Global Optimization Toolbox	Version 4.6
(R2021b)	
HDL Coder	Version 3.19
(R2021b)	
Image Acquisition Toolbox	Version 6.5
(R2021b)	
Image Processing Toolbox	Version 11.4
(R2021b)	
Instrument Control Toolbox	Version 4.5
(R2021b)	
LTE Toolbox	Version 3.6
(R2021b)	
Lidar Toolbox	Version 2.0
(R2021b)	
MATLAB Coder	Version 5.3
(R2021b)	
MATLAB Compiler	Version 8.3
(R2021b)	
MATLAB Compiler SDK	Version 6.11
(R2021b)	
MATLAB Report Generator	Version 5.11
(R2021b)	
Mapping Toolbox	Version 5.2
(R2021b)	
Mixed-Signal Blockset	Version 2.1
(R2021b)	
Model Predictive Control Toolbox	Version 7.2
(R2021b)	
Motor Control Blockset	Version 1.3
(R2021b)	
Navigation Toolbox	Version 2.1
(R2021b)	
Optimization Toolbox	Version 9.2
(R2021b)	
Parallel Computing Toolbox	Version 7.5
(R2021b)	
Partial Differential Equation Toolbox	Version 3.7
(R2021b)	
Phased Array System Toolbox	Version 4.6
(R2021b)	
Powertrain Blockset	Version 1.10

(R2021b)	
Predictive Maintenance Toolbox	Version 2.4
(R2021b)	
RF Blockset	Version 8.2
(R2021b)	
RF PCB Toolbox	Version 1.0
(R2021b)	
RF Toolbox	Version 4.2
(R2021b)	
ROS Toolbox	Version 1.4
(R2021b)	
Radar Toolbox	Version 1.1
(R2021b)	
Reinforcement Learning Toolbox	Version 2.1
(R2021b)	
Risk Management Toolbox	Version 1.10
(R2021b)	
Robotics System Toolbox	Version 3.4
(R2021b)	
Robust Control Toolbox	Version 6.11
(R2021b)	
Satellite Communications Toolbox	Version 1.1
(R2021b)	
Sensor Fusion and Tracking Toolbox	Version 2.2
(R2021b)	
SerDes Toolbox	Version 2.2
(R2021b)	
Signal Processing Toolbox	Version 8.7
(R2021b)	
SimBiology	Version 6.2
(R2021b)	
SimEvents	Version 5.11
(R2021b)	
Simscape	Version 5.2
(R2021b)	
Simscape Driveline	Version 3.4
(R2021b)	
Simscape Electrical	Version 7.6
(R2021b)	
Simscape Fluids	Version 3.3
(R2021b)	
Simscape Multibody	Version 7.4
(R2021b)	
Simulink 3D Animation	Version 9.3
(R2021b)	
Simulink Check	Version 5.2
(R2021b)	
Simulink Coder	Version 9.6
(R2021b)	
Simulink Compiler	Version 1.3

(R2021b)	
Simulink Control Design	Version 6.0
(R2021b)	
Simulink Coverage	Version 5.3
(R2021b)	
Simulink Design Optimization	Version 3.10
(R2021b)	
Simulink Design Verifier	Version 4.6
(R2021b)	
Simulink Desktop Real-Time	Version 5.13
(R2021b)	
Simulink PLC Coder	Version 3.5
(R2021b)	
Simulink Report Generator	Version 5.11
(R2021b)	
Simulink Requirements	Version 1.8
(R2021b)	
Simulink Test	Version 3.5
(R2021b)	
Stateflow	Version 10.5
(R2021b)	
Statistics and Machine Learning Toolbox	Version 12.2
(R2021b)	
Symbolic Math Toolbox	Version 9.0
(R2021b)	
System Composer	Version 2.1
(R2021b)	
System Identification Toolbox	Version 9.15
(R2021b)	
Tensor Toolbox (Sandia Natl Labs & MathSci.ai)	Version 3.4
(R2022c)	
Text Analytics Toolbox	Version 1.8
(R2021b)	
UAV Toolbox	Version 1.2
(R2021b)	
Vehicle Dynamics Blockset	Version 1.7
(R2021b)	
WLAN Toolbox	Version 3.3
(R2021b)	
Wavelet Toolbox	Version 6.0
(R2021b)	
Wireless HDL Toolbox	Version 2.3
(R2021b)	

MATLAB Version: 9.14.0.2239454 (R2023a) Update 1
 MATLAB License Number: 40638290
 Operating System: macOS Version: 12.6.3 Build: 21G419
 Java Version: Java 1.8.0_202-b08 with Oracle Corporation Java

HotSpot(TM) 64-Bit Server VM mixed mode

MATLAB (R2023a)	Version 9.14
Simulink (R2023a)	Version 10.7
Audio Toolbox (R2023a)	Version 3.4
Bioinformatics Toolbox (R2023a)	Version 4.17
Communications Toolbox (R2023a)	Version 8.0
Computer Vision Toolbox (R2023a)	Version 10.4
Control System Toolbox (R2023a)	Version 10.13
Curve Fitting Toolbox (R2023a)	Version 3.9
DSP HDL Toolbox (R2023a)	Version 1.2
DSP System Toolbox (R2023a)	Version 9.16
Database Toolbox (R2023a)	Version 11.0
Deep Learning Toolbox (R2023a)	Version 14.6
Econometrics Toolbox (R2023a)	Version 6.2
Embedded Coder (R2023a)	Version 7.10
Filter Design HDL Coder (R2023a)	Version 3.1.13
Financial Toolbox (R2023a)	Version 6.5
Fixed-Point Designer (R2023a)	Version 7.6
Fuzzy Logic Toolbox (R2023a)	Version 3.1
Global Optimization Toolbox (R2023a)	Version 4.8.1
HDL Coder (R2023a)	Version 4.1
Image Acquisition Toolbox (R2023a)	Version 6.7.1
Image Processing Toolbox (R2023a)	Version 11.7
MATLAB Coder (R2023a)	Version 5.6
MATLAB Compiler	Version 8.6

(R2023a)	
MATLAB Compiler SDK	Version 7.2
(R2023a)	
MATLAB Report Generator	Version 5.14
(R2023a)	
MATLAB Test	Version 1.0
(R2023a)	
Mapping Toolbox	Version 5.5
(R2023a)	
Medical Imaging Toolbox	Version 1.1
(R2023a)	
Model Predictive Control Toolbox	Version 8.1
(R2023a)	
Motor Control Blockset	Version 2.0
(R2023a)	
Optimization Toolbox	Version 9.5
(R2023a)	
Parallel Computing Toolbox	Version 7.8
(R2023a)	
Partial Differential Equation Toolbox	Version 3.10
(R2023a)	
Phased Array System Toolbox	Version 5.0
(R2023a)	
Powertrain Blockset	Version 2.0
(R2023a)	
Predictive Maintenance Toolbox	Version 2.7
(R2023a)	
RF Blockset	Version 8.5
(R2023a)	
RF PCB Toolbox	Version 1.3
(R2023a)	
RF Toolbox	Version 4.5
(R2023a)	
ROS Toolbox	Version 2.0
(R2023a)	
Radar Toolbox	Version 1.4
(R2023a)	
Reinforcement Learning Toolbox	Version 2.4
(R2023a)	
Requirements Toolbox	Version 2.2
(R2023a)	
Risk Management Toolbox	Version 2.2
(R2023a)	
Robotics System Toolbox	Version 4.2
(R2023a)	
Robust Control Toolbox	Version 6.11.3
(R2023a)	
Satellite Communications Toolbox	Version 1.4
(R2023a)	
Sensor Fusion and Tracking Toolbox	Version 2.5

(R2023a)	
SerDes Toolbox	Version 3.0
(R2023a)	
Signal Processing Toolbox	Version 9.2
(R2023a)	
SimBiology	Version 6.4.1
(R2023a)	
SimEvents	Version 5.14
(R2023a)	
Simscape	Version 5.5
(R2023a)	
Simscape Battery	Version 1.1
(R2023a)	
Simscape Driveline	Version 3.7
(R2023a)	
Simscape Electrical	Version 7.9
(R2023a)	
Simscape Fluids	Version 3.6
(R2023a)	
Simscape Multibody	Version 7.7
(R2023a)	
Simulink 3D Animation	Version 9.6
(R2023a)	
Simulink Check	Version 6.2
(R2023a)	
Simulink Coder	Version 9.9
(R2023a)	
Simulink Compiler	Version 1.6
(R2023a)	
Simulink Control Design	Version 7.0
(R2023a)	
Simulink Coverage	Version 5.6
(R2023a)	
Simulink Design Optimization	Version 3.13
(R2023a)	
Simulink Design Verifier	Version 4.9
(R2023a)	
Simulink Desktop Real-Time	Version 5.16
(R2023a)	
Simulink PLC Coder	Version 3.8
(R2023a)	
Simulink Report Generator	Version 5.14
(R2023a)	
Simulink Test	Version 3.8
(R2023a)	
Stateflow	Version 10.8
(R2023a)	
Statistics and Machine Learning Toolbox	Version 12.5
(R2023a)	
Symbolic Math Toolbox	Version 9.3

(R2023a)	
System Composer	Version 2.4
(R2023a)	
System Identification Toolbox	Version 10.1
(R2023a)	
Tensor Toolbox (Sandia Natl Labs & MathSci.ai)	Version 3.4
(R2022c)	
Text Analytics Toolbox	Version 1.10
(R2023a)	
UAV Toolbox	Version 1.5
(R2023a)	
Vehicle Dynamics Blockset	Version 2.0
(R2023a)	
WLAN Toolbox	Version 3.6
(R2023a)	
Wavelet Toolbox	Version 6.3
(R2023a)	
Wireless HDL Toolbox	Version 2.6
(R2023a)	

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MATLAB Version: 9.13.0.2080170 (R2022b) Update 1
MATLAB License Number: 40638290
Operating System: Linux 4.18.0-348.12.2.el8_5.x86_64 #1 SMP Wed Jan 19
17:53:40 UTC 2022 x86_64
Java Version: Java 1.8.0_202-b08 with Oracle Corporation Java
HotSpot(TM) 64-Bit Server VM mixed mode
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MATLAB	Version 9.13
(R2022b)	
Simulink	Version 10.6
(R2022b)	
5G Toolbox	Version 2.5
(R2022b)	
AUTOSAR Blockset	Version 3.0
(R2022b)	
Aerospace Blockset	Version 5.3
(R2022b)	
Aerospace Toolbox	Version 4.3
(R2022b)	
Antenna Toolbox	Version 5.3
(R2022b)	
Audio Toolbox	Version 3.3
(R2022b)	
Automated Driving Toolbox	Version 3.6
(R2022b)	
Bioinformatics Toolbox	Version 4.16.1
(R2022b)	

Bluetooth Toolbox (R2022b)	Version 1.1
Communications Toolbox (R2022b)	Version 7.8
Computer Vision Toolbox (R2022b)	Version 10.3
Control System Toolbox (R2022b)	Version 10.12
Curve Fitting Toolbox (R2022b)	Version 3.8
DDS Blockset (R2022b)	Version 1.3
DSP HDL Toolbox (R2022b)	Version 1.1
DSP System Toolbox (R2022b)	Version 9.15
Database Toolbox (R2022b)	Version 10.4
Datafeed Toolbox (R2022b)	Version 6.3
Deep Learning HDL Toolbox (R2022b)	Version 1.4
Deep Learning Toolbox (R2022b)	Version 14.5
Econometrics Toolbox (R2022b)	Version 6.1
Embedded Coder (R2022b)	Version 7.9
Filter Design HDL Coder (R2022b)	Version 3.1.12
Financial Instruments Toolbox (R2022b)	Version 3.5
Financial Toolbox (R2022b)	Version 6.4
Fixed-Point Designer (R2022b)	Version 7.5
Fuzzy Logic Toolbox (R2022b)	Version 3.0
GPU Coder (R2022b)	Version 2.4
Global Optimization Toolbox (R2022b)	Version 4.8
HDL Coder (R2022b)	Version 4.0
HDL Verifier (R2022b)	Version 7.0
Image Acquisition Toolbox (R2022b)	Version 6.7
Image Processing Toolbox (R2022b)	Version 11.6

Industrial Communication Toolbox (R2022b)	Version 6.1
Instrument Control Toolbox (R2022b)	Version 4.7
LTE Toolbox (R2022b)	Version 3.8
Lidar Toolbox (R2022b)	Version 2.2
MATLAB Coder (R2022b)	Version 5.5
MATLAB Compiler (R2022b)	Version 8.5
MATLAB Compiler SDK (R2022b)	Version 7.1
MATLAB Report Generator (R2022b)	Version 5.13
Mapping Toolbox (R2022b)	Version 5.4
Medical Imaging Toolbox (R2022b)	Version 1.0
Mixed-Signal Blockset (R2022b)	Version 2.3
Model Predictive Control Toolbox (R2022b)	Version 8.0
Motor Control Blockset (R2022b)	Version 1.5
Navigation Toolbox (R2022b)	Version 2.3
Optimization Toolbox (R2022b)	Version 9.4
Parallel Computing Toolbox (R2022b)	Version 7.7
Partial Differential Equation Toolbox (R2022b)	Version 3.9
Phased Array System Toolbox (R2022b)	Version 4.8
Powertrain Blockset (R2022b)	Version 1.12
Predictive Maintenance Toolbox (R2022b)	Version 2.6
RF Blockset (R2022b)	Version 8.4
RF PCB Toolbox (R2022b)	Version 1.2
RF Toolbox (R2022b)	Version 4.4
ROS Toolbox (R2022b)	Version 1.6
Radar Toolbox (R2022b)	Version 1.3

Reinforcement Learning Toolbox (R2022b)	Version 2.3
Requirements Toolbox (R2022b)	Version 2.1
Risk Management Toolbox (R2022b)	Version 2.1
Robotics System Toolbox (R2022b)	Version 4.1
Robust Control Toolbox (R2022b)	Version 6.11.2
Satellite Communications Toolbox (R2022b)	Version 1.3
Sensor Fusion and Tracking Toolbox (R2022b)	Version 2.4
SerDes Toolbox (R2022b)	Version 2.4
Signal Integrity Toolbox (R2022b)	Version 1.2
Signal Processing Toolbox (R2022b)	Version 9.1
SimBiology (R2022b)	Version 6.4
SimEvents (R2022b)	Version 5.13
Simscape (R2022b)	Version 5.4
Simscape Battery (R2022b)	Version 1.0
Simscape Driveline (R2022b)	Version 3.6
Simscape Electrical (R2022b)	Version 7.8
Simscape Fluids (R2022b)	Version 3.5
Simscape Multibody (R2022b)	Version 7.6
Simulink 3D Animation (R2022b)	Version 9.5
Simulink Check (R2022b)	Version 6.1
Simulink Code Inspector (R2022b)	Version 4.2
Simulink Coder (R2022b)	Version 9.8
Simulink Compiler (R2022b)	Version 1.5
Simulink Control Design (R2022b)	Version 6.2
Simulink Coverage (R2022b)	Version 5.5

Simulink Design Optimization (R2022b)	Version 3.12
Simulink Design Verifier (R2022b)	Version 4.8
Simulink PLC Coder (R2022b)	Version 3.7
Simulink Real-Time (R2022b)	Version 8.1
Simulink Report Generator (R2022b)	Version 5.13
Simulink Test (R2022b)	Version 3.7
SoC Blockset (R2022b)	Version 1.7
Stateflow (R2022b)	Version 10.7
Statistics and Machine Learning Toolbox (R2022b)	Version 12.4
Symbolic Math Toolbox (R2022b)	Version 9.2
System Composer (R2022b)	Version 2.3
System Identification Toolbox (R2022b)	Version 10.0
Text Analytics Toolbox (R2022b)	Version 1.9
UAV Toolbox (R2022b)	Version 1.4
Vehicle Dynamics Blockset (R2022b)	Version 1.9
Vehicle Network Toolbox (R2022b)	Version 5.3
Vision HDL Toolbox (R2022b)	Version 2.6
WLAN Toolbox (R2022b)	Version 3.5
Wavelet Toolbox (R2022b)	Version 6.2
Wireless HDL Toolbox (R2022b)	Version 2.5
Wireless Testbench (R2022b)	Version 1.1