



CS500 Systems Evaluation Lab (light seminar)

What to expect

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- Only **in-person class** offered by CS Department in spring 2021;
one credit light seminar
- Instructor: Ulrich Kremer (uli@cs.rutgers.edu)
→ My Office Hours via webex: Wednesdays 9:30am - 10:30am
<https://rutgers.webex.com/meet/uli>
- Web Site: http://www.cs.rutgers.edu/courses/500/classes/spring_2021_kremer/
- Piazza: <https://piazza.com/class/klgpktou9bg3fz>

Goal of class:

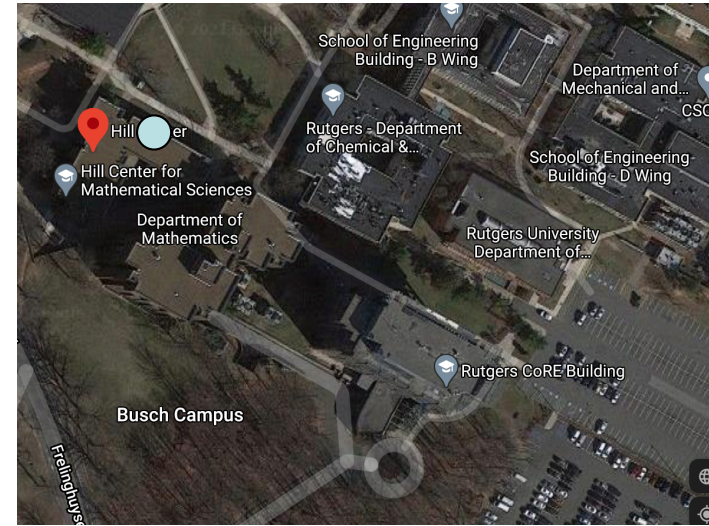
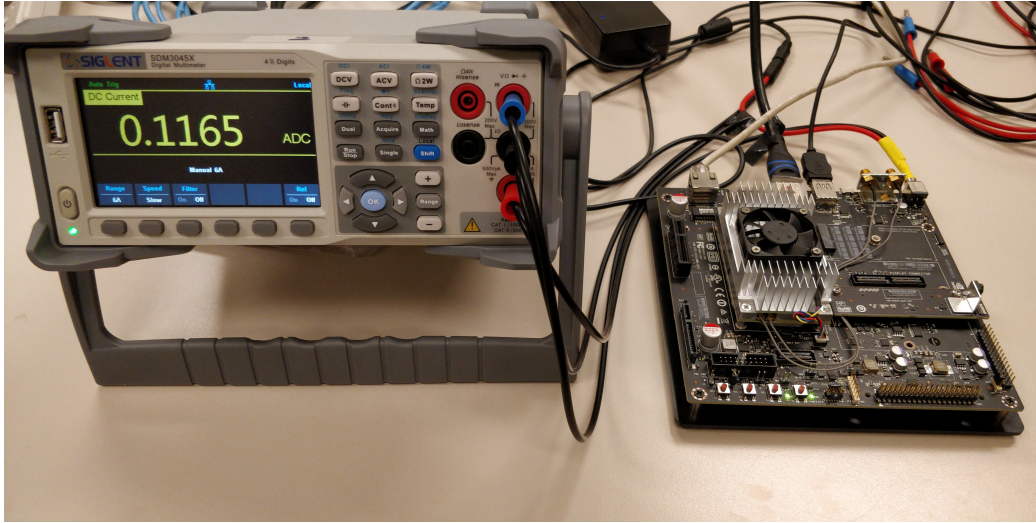
Get familiar with different performance metrics commonly used to assess benefits of hardware/software optimizations and system configurations. This lab will cover power, energy, execution time, and temperature as system evaluation metrics.

Deliverables:

Two projects with written reports:

- (1) **Write a “system stresser”** that draws as much power as possible for at least 3 seconds; implementation language is up to you, but must be supported on our TX-1 board. 1 -2 page report in pdf; submit via sakai.
- (2) **Evaluation of a provided image analysis benchmark** on TX-1 board (single thread vs. multi-thread vs. GPU). Program is written in C++ and CUDA. Executable is provided. 3 to 5 page report in pdf; submit via sakai.

○ Hill 254



- Four lab stations, physically distanced in each corner of the room. Lab stations will be marked. Each station: Multimeter and TX-1 board; bring your laptop to log into ilab; access to board/multimeter through your ilab account
- Lab times: Tuesday/Wednesday/Thursday: 1:00pm-5:00pm; first lab day: sometime next week; last lab day: Thursday, April 8 (tentative); **in advance sign-up required**
- LA (learning assistant) will be on site
- 4 additional TX-1 boards for functional testing with remote access through ilab;

Please see instruction and links on our class web page

Rutgers now requires all students, faculty, and staff who will be on campus regularly to participate in weekly SARS-CoV-2 (COVID-19) testing. All students enrolled in this course participate in in-person instructional activities and therefore must participate in weekly testing.

More information can be found at: [On Campus Testing website](#). If you have questions, please contact Student Health at 848-932-7402 or health@rutgers.edu.

Each day before you arrive on campus, you must complete the brief survey on the [My Campus Pass symptom checker](#) self-screening app.

Masks must be worn by all persons on campus when in the presence of others (within six feet) and in buildings in non-private enclosed settings (e.g., common workspaces, workstations, meeting rooms, classrooms, etc.). Masks must be worn during class meetings; any student not wearing a mask will be asked to leave.

Additional safety information

Please bring your own labtop to the lab. There is also one dedicated lab station with an ilab machine that does not require your labtop. Using your labtop reduces the contact with shared equipment.

There will be a TA/LA available on site. He/she will be able to answer questions regarding the equipment, and will clean your station after each use.

Gloves and hand sanitizers will be available in Hill 254.

Additional safety information

There will be a sign-up sheet for 2 hours slots each lab day (Tuesday/Wednesday/Thursday). This will be a shared google document. You can only sign up 24 hours before the desired slot. If you sign-up for a slot, but do not show, you are taking away somebody else's chance of using the equipment. The TA/LA will take attendance.

No lab hours during spring recess (March 16 through 18).

We have five weeks of lab hours: $5 \text{ (weeks)} \times 3 \text{ (days)} \times 4 \text{ (stations)} \times 2 \text{ (slots per station)} = 120 \text{ slots}$. We have 18 students taking this class. You should be able to finish the measurement parts of the project using two slots. **WARNING: Measurement equipment can be fragile, i.e., may fail or be temperamental.**



The Tech Specs

JETSON TX1 MODULE

- NVIDIA Maxwell™ GPU with 256 NVIDIA® CUDA® Cores
- Quad-core ARM® Cortex®-A57 MPCore Processor
- 4 GB LPDDR4 Memory
- 16 GB eMMC 5.1 Flash Storage
- 10/100/1000BASE-T Ethernet

JETSON CAMERA MODULE

- 5 MP Fixed Focus MIPI CSI Camera

BUTTONS

- Power On/Off
- Reset
- Force Recovery
- User-Defined

I/O

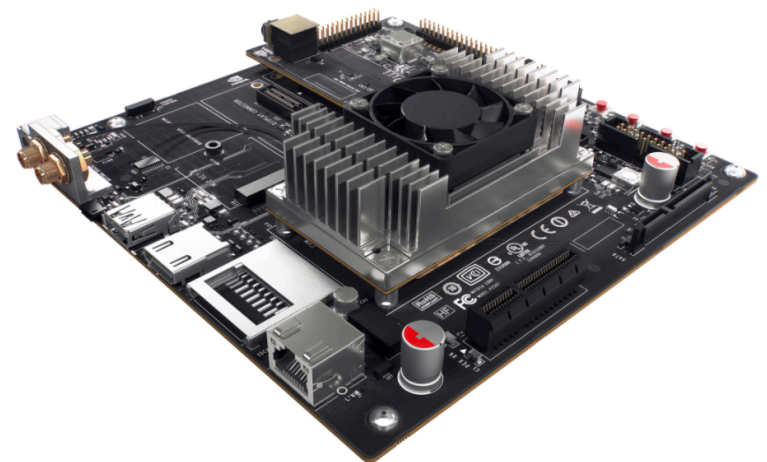
- USB 3.0 Type A
- USB 2.0 Micro AB (supports recovery and host mode)
- HDMI
- M.2 Key E
- PCI-E x4
- Gigabit Ethernet
- Full-Size SD
- SATA Data and Power
- GPIOs, I2C, I2S, SPI*
- TTL UART with Flow Control
- Display Expansion Header*
- Camera Expansion Header*
- *I/O expansion headers: refer to product documentation for header specification.

POWER OPTIONS

- External 19V AC adapter

The following items are recommended, but not included:

- HDMI Display and Cable (Type A)
- Keyboard and Mouse
- JTAG Debugger
- TTL to RS232 UART



- 8 systems:
- 4 Lab station machines (in the lab)
 - 4 Testing platforms (remotely)

SDM3045X Digital Multimeter

Main Function

Basic Measurement Function

- 🔌 DC Voltage: 600 mV - 1000 V
- 🔌 DC Current: 600 μ A - 10 A
- 🔌 AC Voltage: True-RMS, 600 mV - 750 V
- 🔌 AC Current: True-RMS, 60 mA - 10 A
- 🔌 2/4-Wire Resistance: 600 Ω - 100 M Ω
- 🔌 Capacitance: 2 nF - 10000 μ F
- 🔌 Continuity Test: Range is fixed at 2 k Ω
- 🔌 Diode Test: Adjustable range is 0-4 V.
- 🔌 Frequency Measurement: 20 Hz - 500 KHz
- 🔌 Period Measurement: 2 μ s - 0.05 s
- 🔌 Temperature: Support for TC and RTD sensor
- 🔌 Max, Min, Average, Standard Deviation,
dBm/dB, Relative Measurement, Pass/Fail
Histogram, Trend Chart

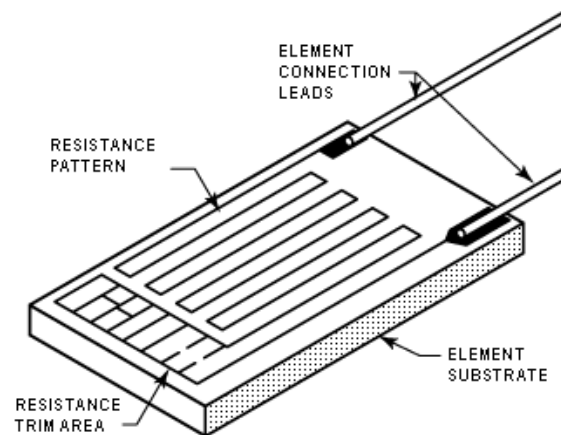


Main Features

- 🔌 Real 4½ digit (66000 count) readings resolution
- 🔌 Up to 150 rdgs/s measurement speed
- 🔌 True-RMS AC Voltage and AC Current measuring
- 🔌 1 Gb NAND flash size, Mass storage configuration files and data files
- 🔌 Built-in cold terminal compensation for thermocouple
- 🔌 With easy, convenient and flexible PC software: EasyDMM
- 🔌 Standard interface: USB Device, USB Host, LAN (Optional Accessories: USB-GPIB Adapter)
- 🔌 USB & LAN remote interfaces support common SCPI command set. Compatible with other popular DMMs on the market.

Will use a RTD (Resistance Temperature Detector) sensor for the TX-1 board.

Additional infrastructure - still testing it.



Assignment of remote testing platforms. Everyone will have the same user name "csuser". The TX-1 systems run Linux. I will send you the machine name and password via email. Be **gentle, considerate, and nice**, i.e., try not to shutdown or hang your board. System support will only be there to reboot during daytime hours.

I will post the project descriptions over the weekend. Watch out for my sakai announcement.

Next lecture: Monday, March 1, at 5:00pm.

- Discussion of software to control multimeter
- Specific details about the projects
- What not to do with the board and multimeter

Lectures are recorded and posted on our class web site.

Post questions on piazza.

<https://piazza.com/class/klgpktou9bg3fz>