Skill learning Telepresence robots for remote support

avatarcore

avatarin

Human Brain. Any Robot.

Charith Fernando | CTO, a v a t a r i n, I n c.

The Evolution of Mobility

Tokyo → 8,000km → **Abu Dhabi**

100 days @ 4km/hr

10 days @ 40km/hr

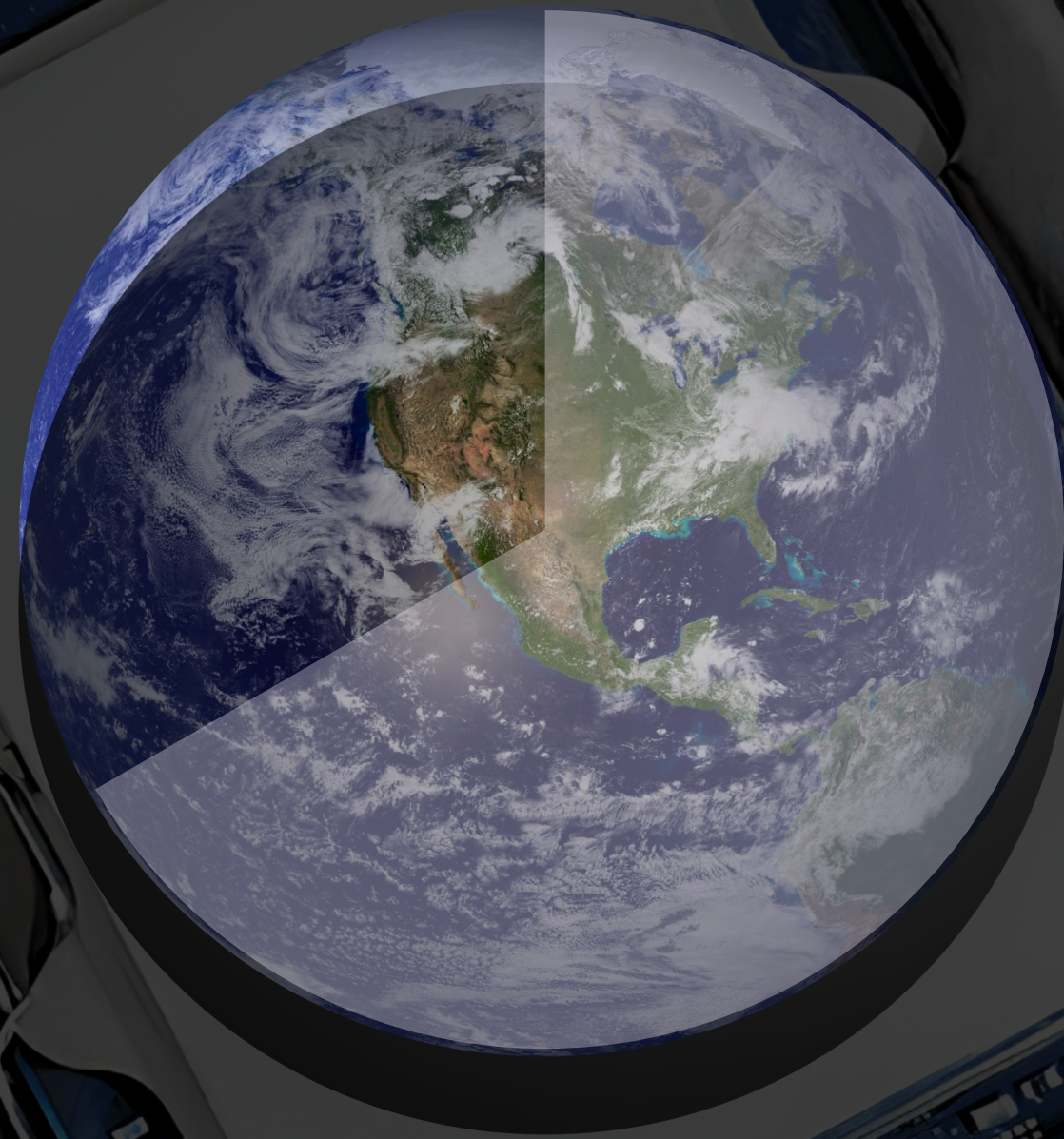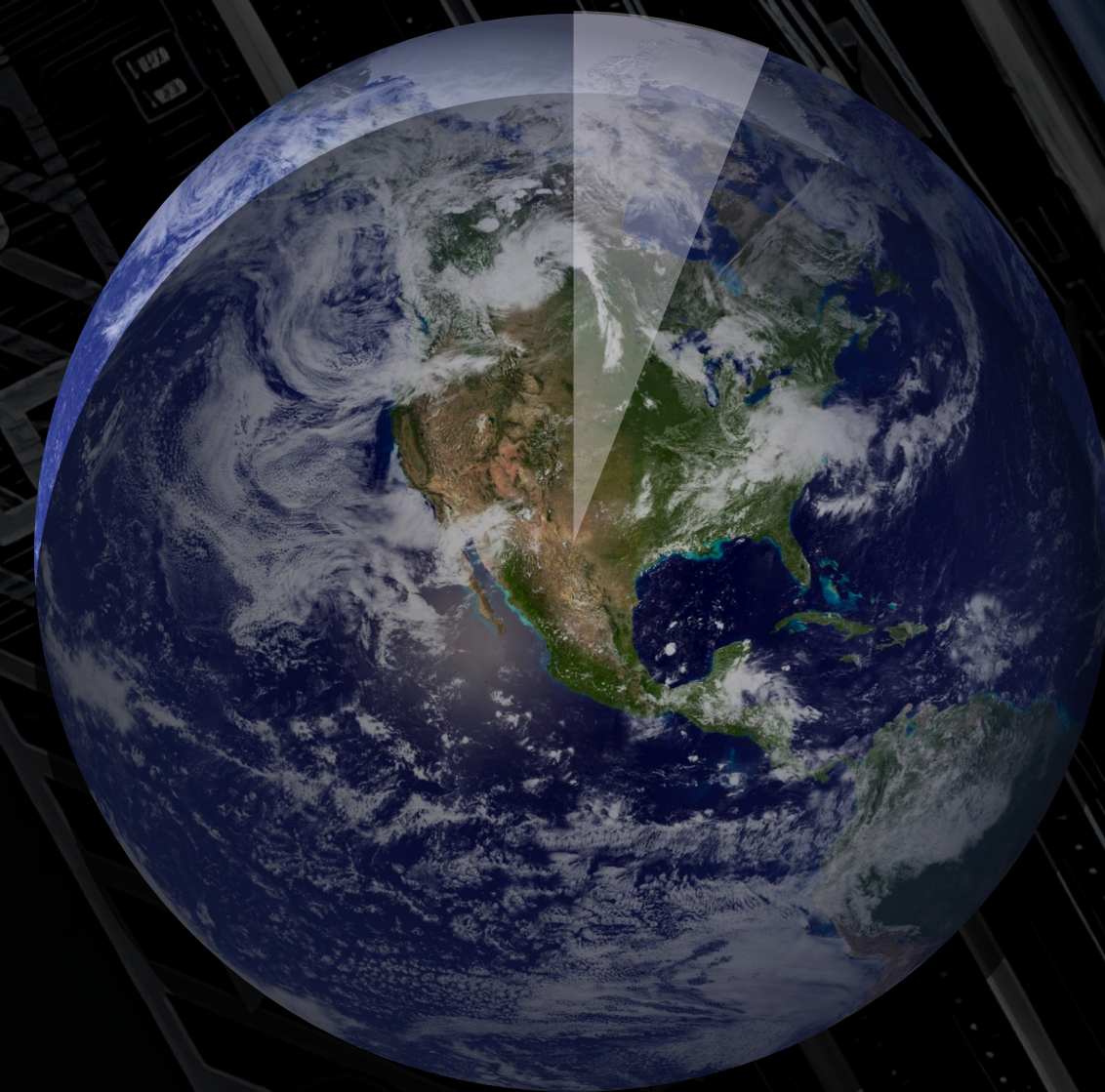**10 hours @ 950km/hr**

100 ms @ Internet Speed

Global mobility has enabled humanity to share its knowledge and skills.

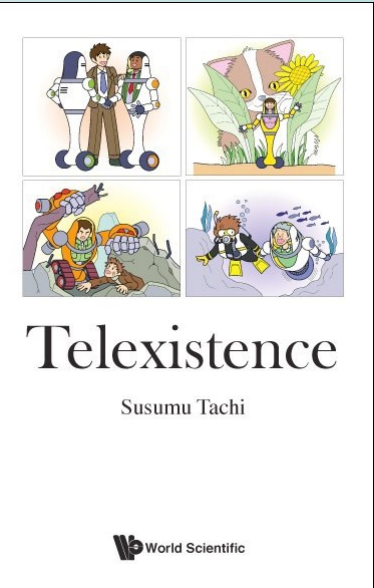But distance, time, cost, and physical infrastructure remain an issue…

Online : 66%

Air Travel: 6%
(Annual)

What about....

Bodily Border, & Haptic Telexistence over Network

Telexistence
Susumu Tachi
World Scientific

To reach an object, operator can move his upper body up/down, sides or front/back

TELESAR VI is a humanoid telexistence robot with 67 degrees of freedom.

Telesar 5 System (Keio University, 2012)

(See, Hear & Feel

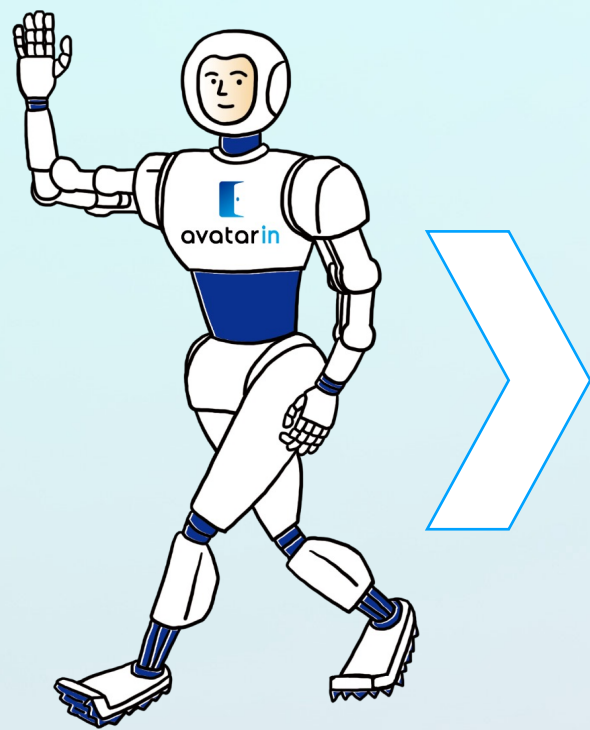*Telesar 6 System (The University of Tokyo, 2019)*

Compact, Networked

Create avatars, Create Infrastructure, Deployment

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AVATAR XPRIZE
*Global Prize
Competition*
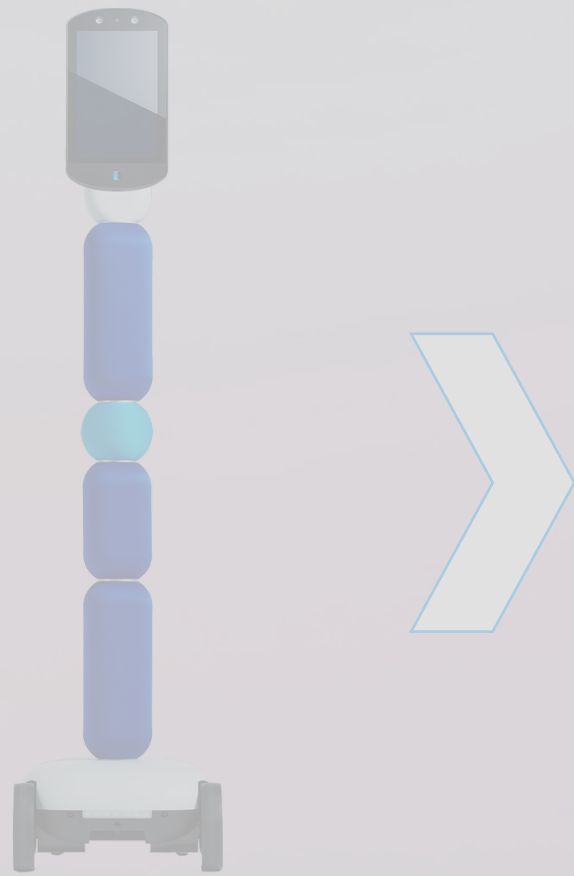
2016 XPRIZE Visioneers Summit

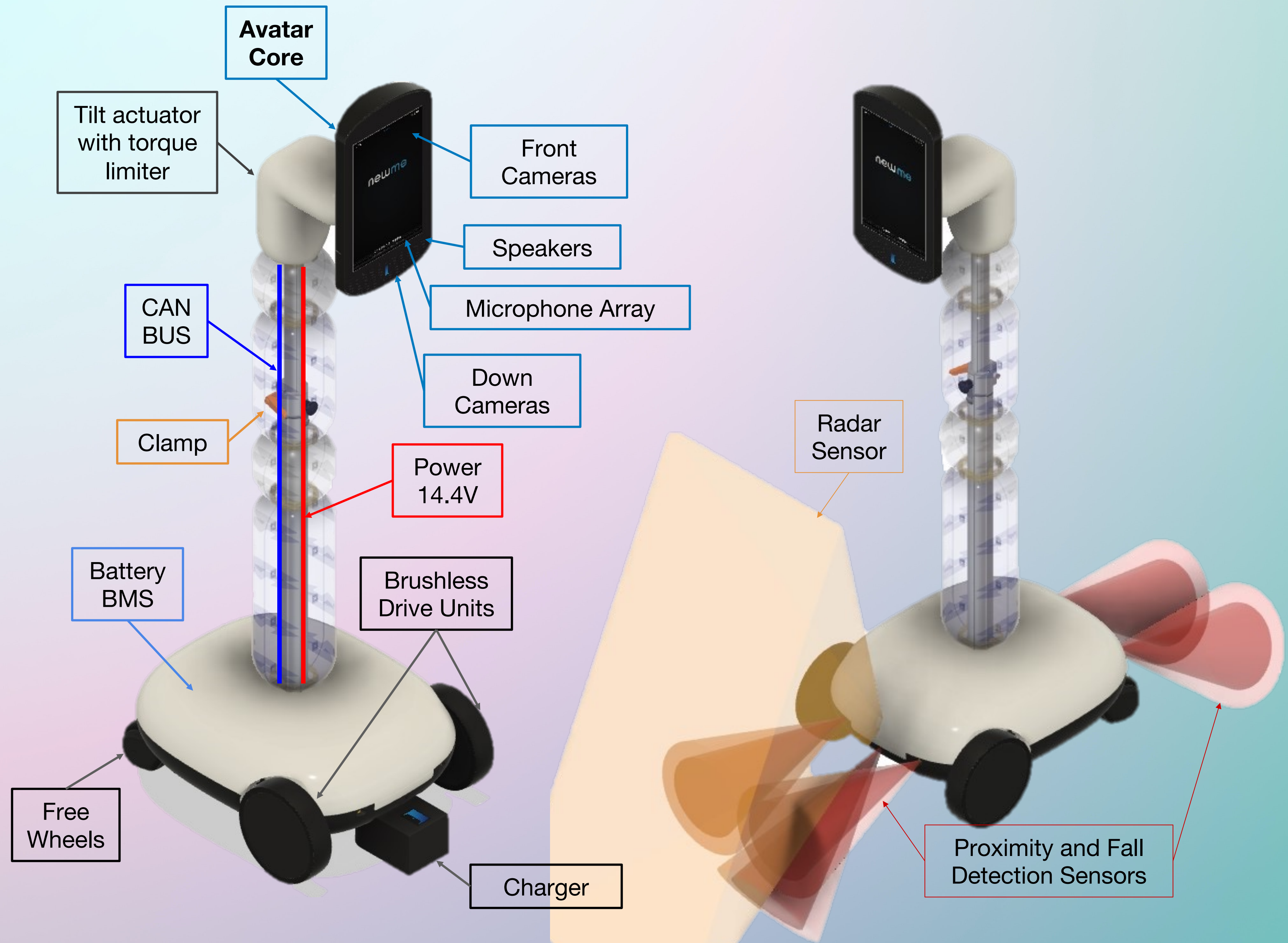2022 - Team NimbRo, University of Bonn

*avatarin
Market
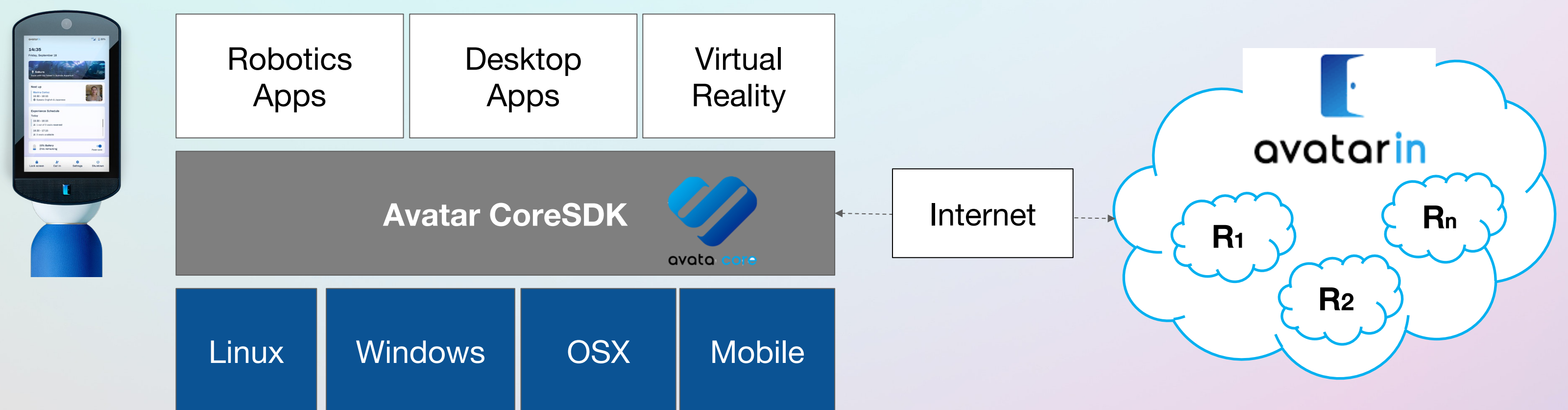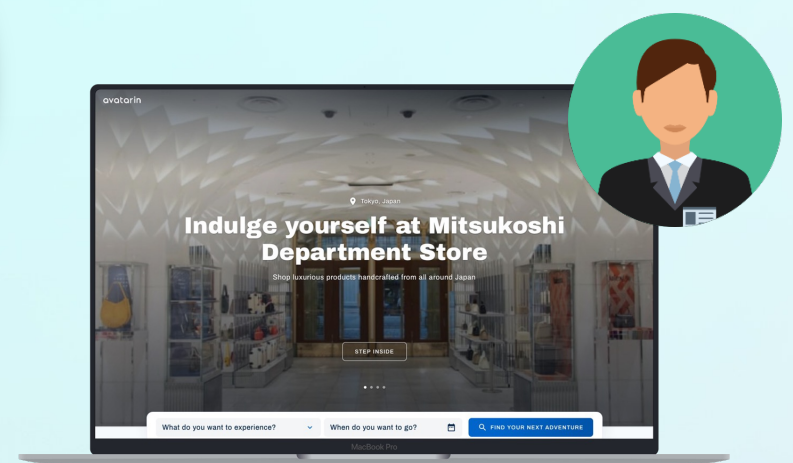Deployment*

2019 - ANA Inaugural Ceremony

2020 - Launch avatarin Inc.

What is Newme

- Dimension - 350mm × 440mm × L (adjustable height 1000mm, 1300mm 1500mm)

- Weight – 15Kg, Speed – 1.9km/h, Barrier free compatible

- 10.1-inch display w/ Touch panel

- Front cameras (Stereo camera (2K) + Autofocus camera), Down camera

- Microphone array and 3.6W Speaker

- Earphone jack, USB Type-C charging port

- Proximity sensors, fall sensors, Radar Sensor

- Lithium-Ion Battery,. Full charge: 3 hours, (80% in 2 hours, Operating time: Approximately 6 hours

- Wi-Fi 5 compatible (5GHz recommended), LTE-A compatible, Bluetooth 4.2 class 2 * Coming soon

Avatar Core

Tilt actuator with torque limiter

Front Cameras

Speakers

Microphone Array

CAN BUS

Down Cameras

Clamp

Power 14.4V

Battery BMS

Brushless Drive Units

Free Wheels

Charger

Radar Sensor

Proximity and Fall Detection Sensors

What is avatarCore

Robotics Apps	Desktop Apps	Virtual Reality

Avatar CoreSDK

Linux	Windows	OSX	Mobile

Internet

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R₁ R₂ Rₙ

- Robotics & real-time media communication frameworks are either dedicated to specific applications (e.g. ROS) or requires heavy development stack to utilize (e.g. WebRTC)

- CoreSDK is developed to as a middleware for avatars applications and facilitates real-time communications (1:1 or 1:n) over internet using a dedicated streaming service (cloud service) and enables communication outside the lab environments.
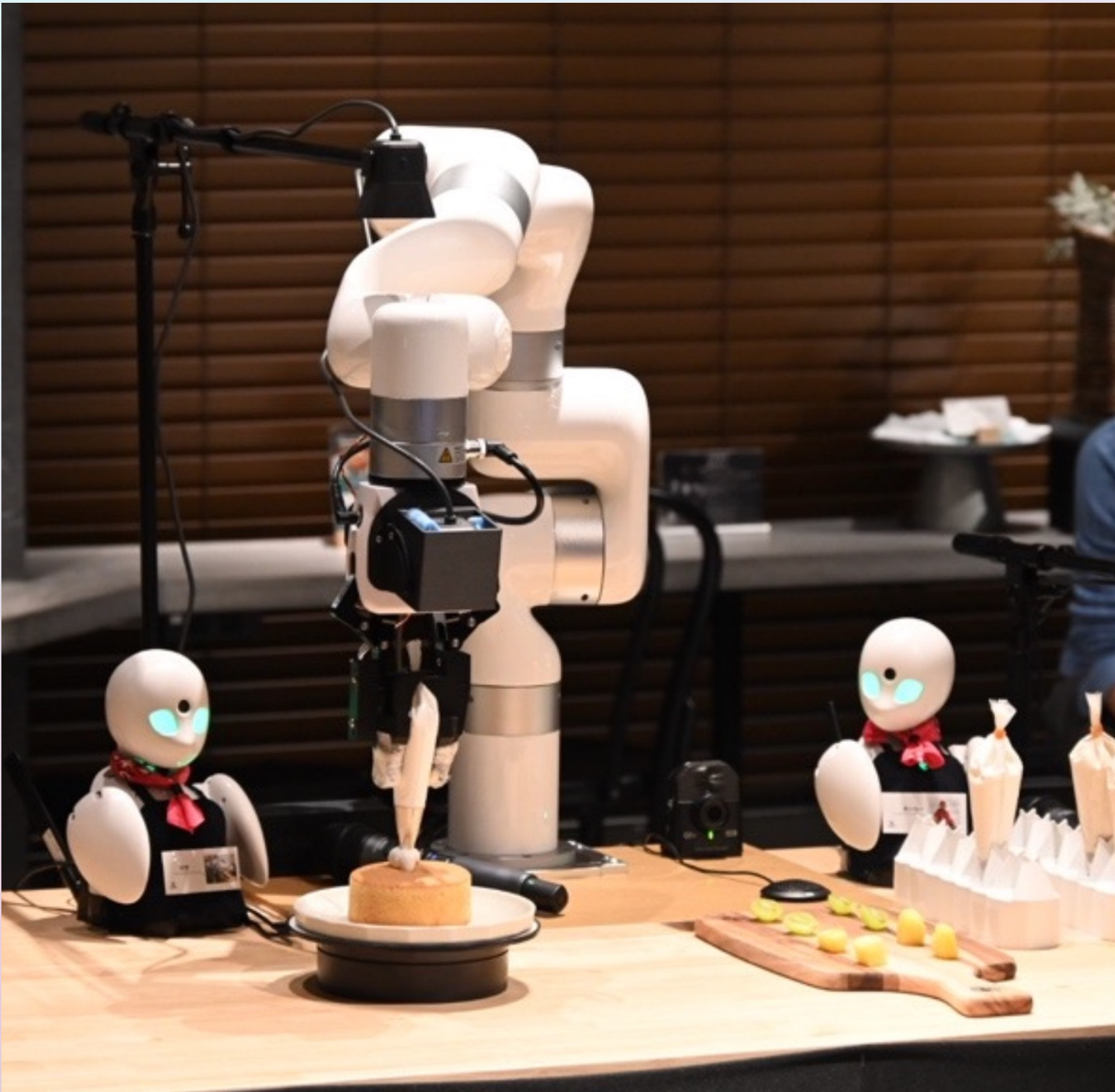
One brain, one software, any robot

CoreSDK Usage

avatarCore SDK supports multiple programming languages, including C++, JavaScript where the **Python & Unity** versions are developed by Moonshot (*Cybernetic being*) Project and used in various applications.

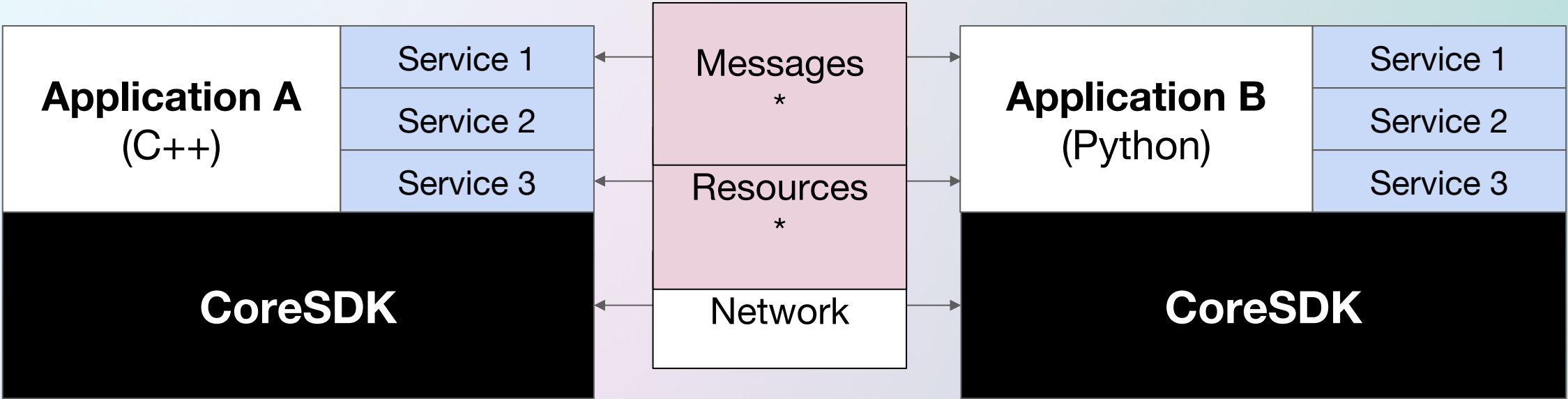Electric Wheelchair controlled remotely (Python)

Demonstrate co-creation with 2 user input for cafes (Python)

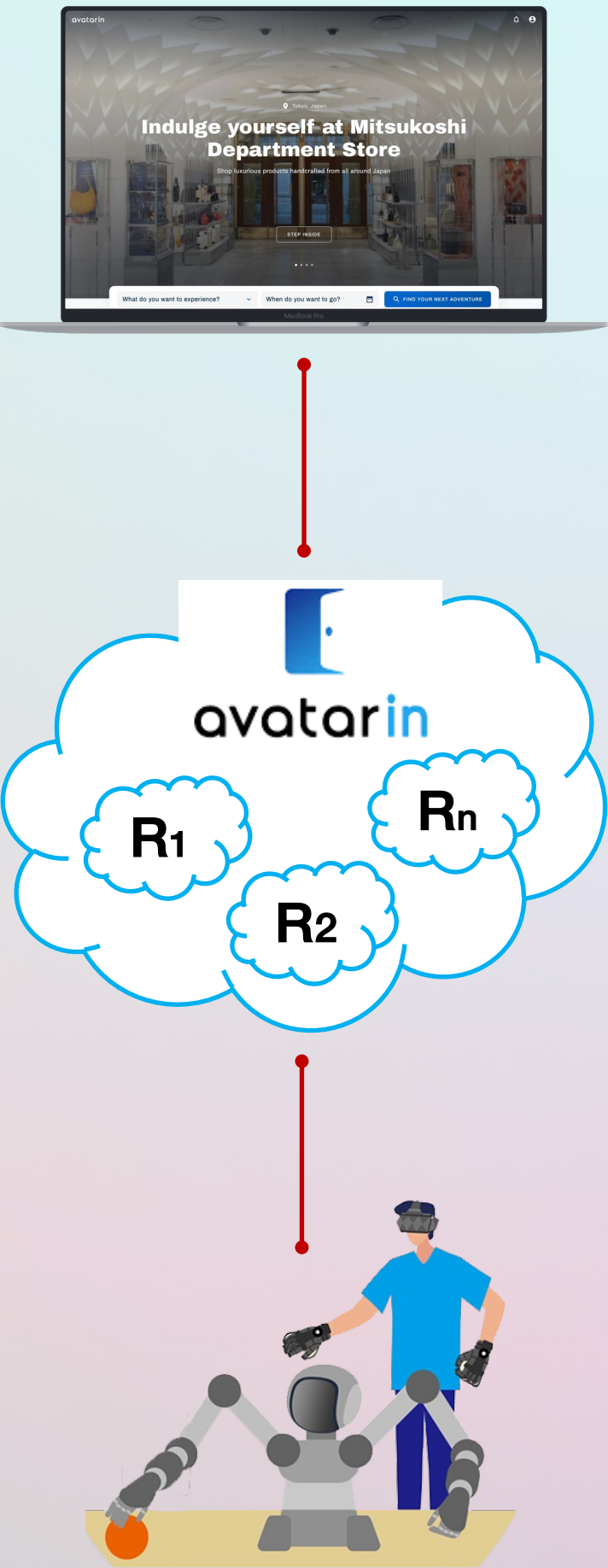Lightweight Wearable Arm System for remote manipulation (Unity C#)
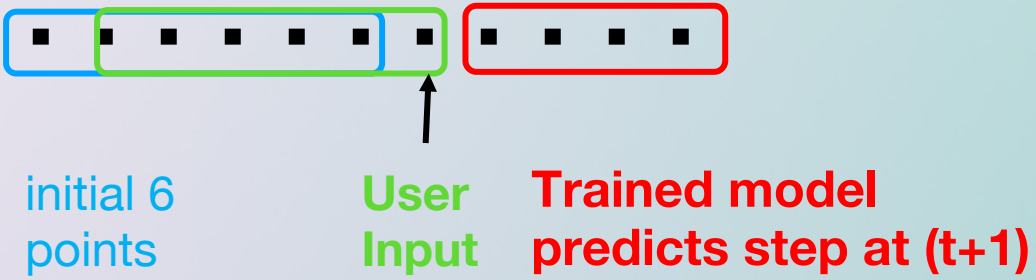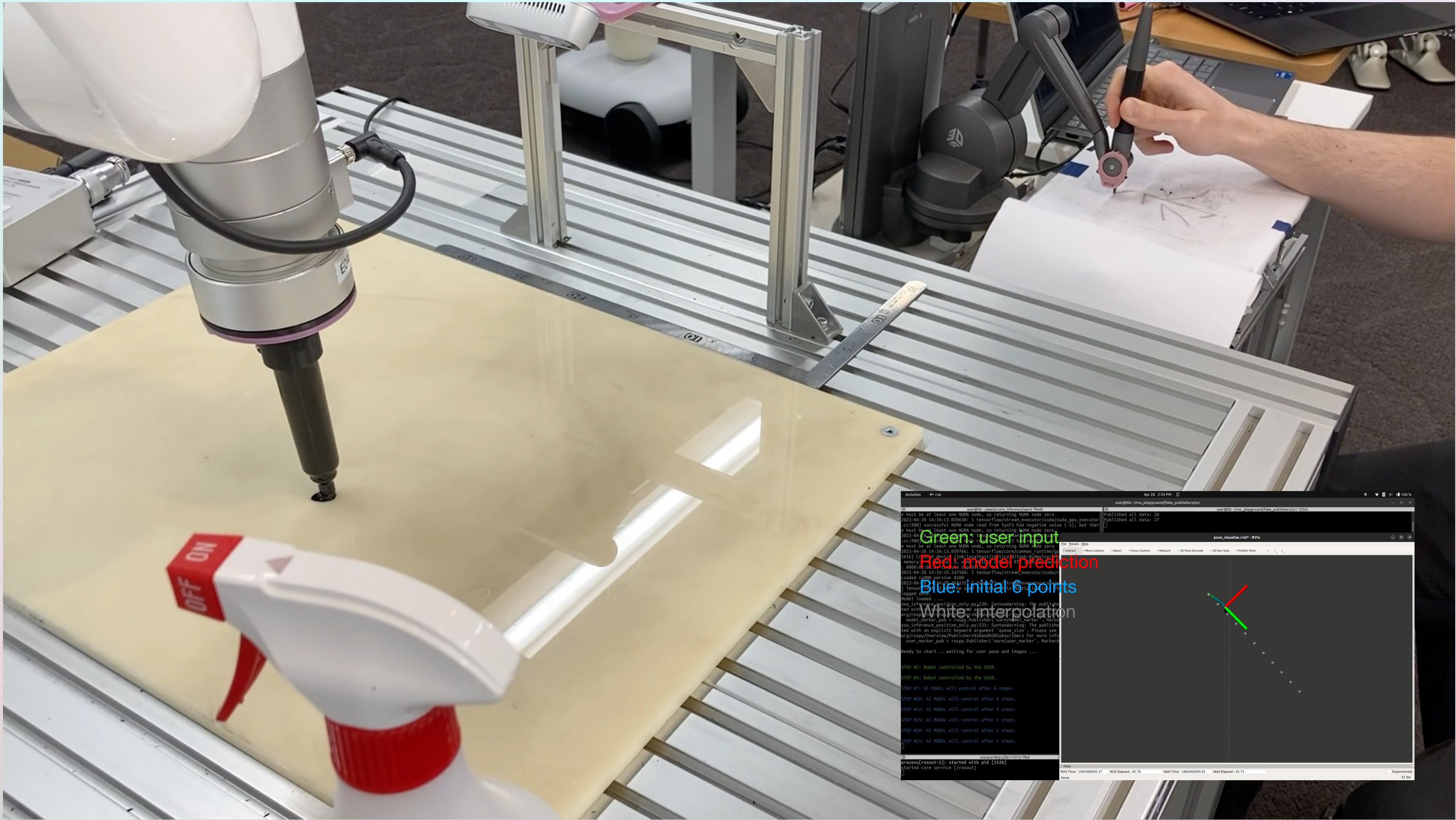
avatarCore™ vs Others

- Compatibility: Natively support major OS and architectures

- Networking: Low latency large data Inter/Intra-communication

- Resource Streaming: native ARTC Cloud or P2P streaming support over internet (low latency ~15ms in Japan)

- Modularity: Services and applications can be developed and run separately

- Messaging: Publisher/Subscriber Messaging within Services or Applications for sending notifications or control signals between various components or processes.

- Shared Resources: Zero-latency copy (images, audio, data) resources between local apps or services and supports multi-processes applications

- Performance: All base source code is developed and optimized in C++

- High level languages: SDK is ported to Python, JavaScript, Unity3D, ROS

- Mobility: Optimized for mobile applications (Supports 5G/LTE/WiFi)

Skill learning: Bimanual Arm & Hands

User Point of View

Replay speed x3

Character Writing, & Learn by Demonstration

initial 6 points — **User Input** — **Trained model predicts step at (t+1)**

- 6 points of user input is taken into predict the next movement.

- User input and model prediction is merged in order to give a feeling of sense of agency.

- User feels that their input is driving the robot that writes the kanji character

Future vision of avatarCore

- Build a common global platform where people can share various professional skills.

- Wide variety of devices can be connected to the Platform, including robots and mobility devices, and "avatarin" to realize a world where anyone can help each other anytime, anywhere.

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Thank you

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