



# inrobics

## The next revolution in rehab

A spin-off of



participated by



# THE FOUNDERS: 10 YEARS WORKING TOGETHER



**José Carlos Pulido**  
**CEO**

Ph.D.  
MBA in Digital Health Management  
Human-robot interaction, AI and e-Health



**José Carlos González**  
**CTO**

Ph.D.  
International stay at Carnegie Mellon University  
Robotic architectures and back-end processes



**Fernando Fernández**  
**CSO**

Ph.D.  
Faculty of the Computer Science Dept. at UC3M  
15+ years leading AI and robotics R&D projects

# KEY INGREDIENTS

Click to see more



el hatillo



**NAOTHERAPIST**  
Autonomous Social Robotics for Rehabilitation

**uc3m** | Universidad  
**Carlos III**  
de Madrid



 USC University of  
Southern California

# Inrobics proposes an innovative rehab solution



through an **intelligent robotic co-therapist** that improves treatment adherence and efficacy of people with **functional or neurological diversity**

# OUR VALUE PROPOSITION

Inrobics



**inrobics**

Usuario

Contraseña

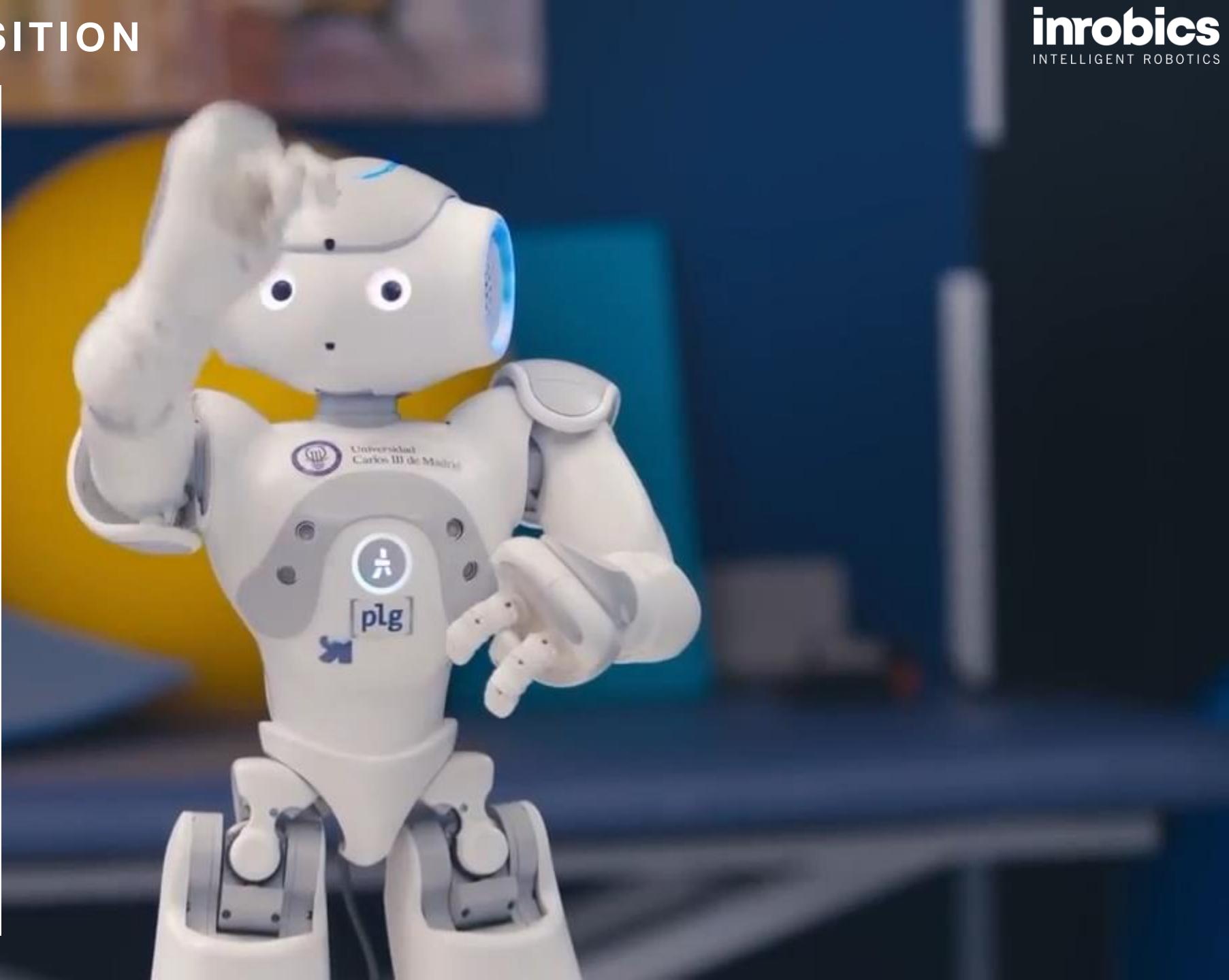
**INICIAR**

**DEBUG**    **TEST**

[Aviso legal](#)

[Política de privacidad](#)

v2021.03.19.115340



## *Emerging technologies*



### SOCIAL ASSISTIVE ROBOTICS

Provides social and emotional interactions

#### **Why a robot?**

Robots outperformed non-embodied agents in **78,5%** of the 65 analyzed studies.



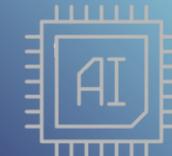
### DIGITAL HEALTH

Learning and exploitation of data



### MARKING AS MEDICAL DEVICE

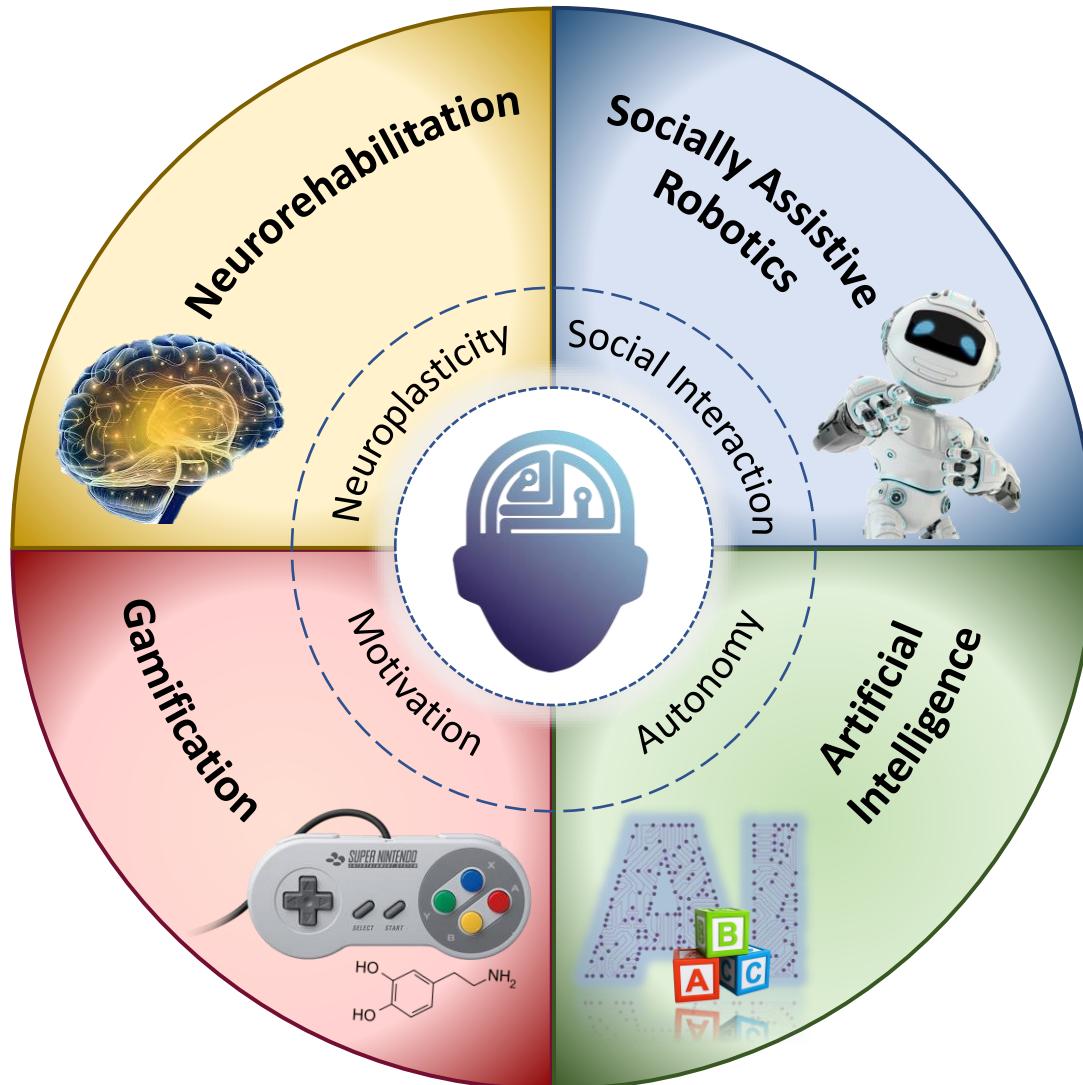
Distinctive and clinically specialized



### ARTIFICIAL INTELLIGENCE

Autonomy and cost-efficiency

# FUNDAMENTALS



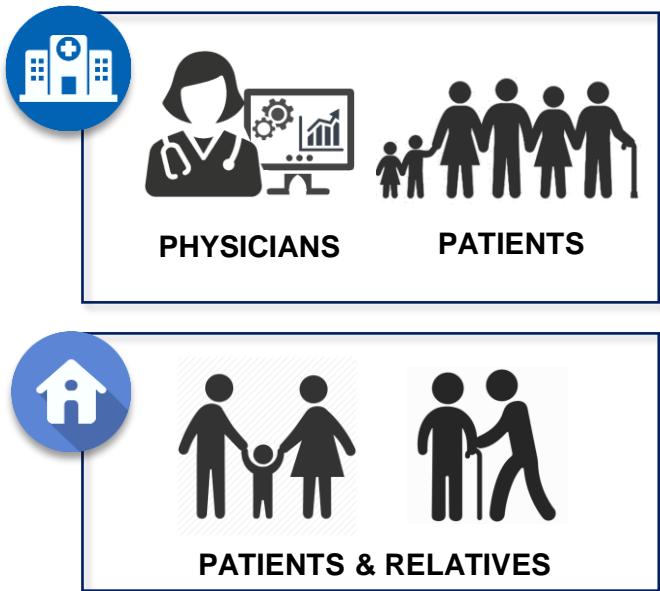
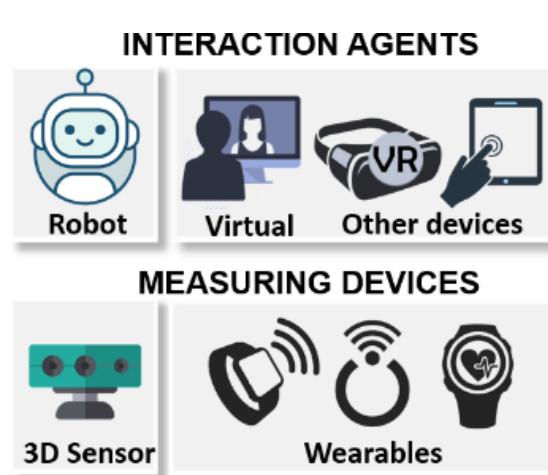
Our Know-how:

1. Make systems behave **autonomously**
2. Ensure an **effective** human-robot interaction
3. Translate clinical procedures into **real** use cases
4. Keep users focused and **engaged** to treatment

# OUR ASSET: HI, THIS IS ALMA



CE



3D Vision

Now



**Rehab Clinic**

Social robot

Q1 2022



**Rehab Home**

Virtual representation

THE MOST ADVANCED INTELLIGENCE SYSTEM FOR REHAB

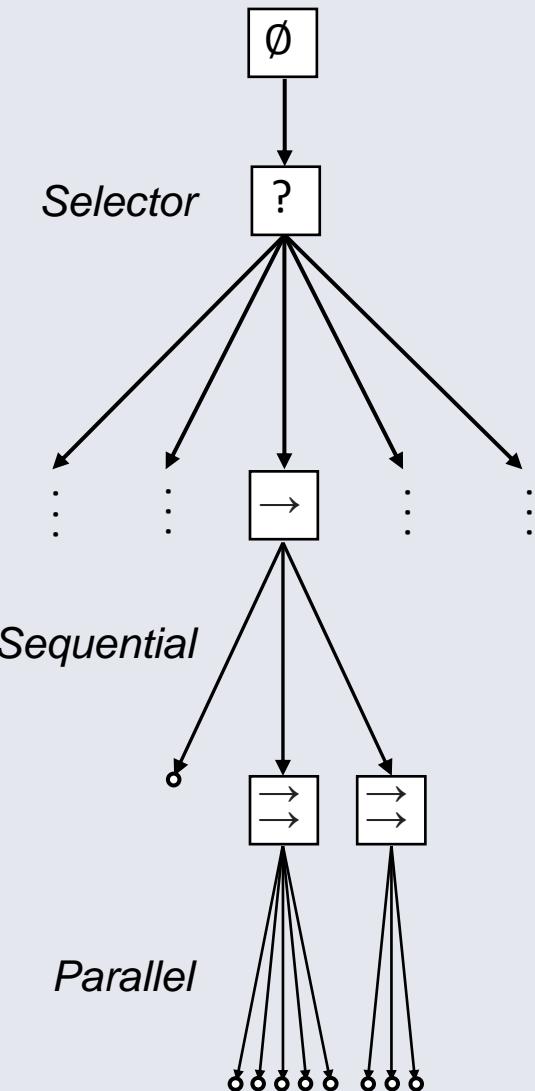
- **Procedural control**

- Behavioral trees [Ögren et al. 2018]
- Tree sets can model use cases
- Action decompositions save deliberation time

- **Deliberation**

- Decomposed deliberation
- Higher layers: deliberative
- Lower layers: reactive
- Several simpler problems are easier

## Action decomposition



# COGNITIVE ARCHITECTURE

(:action FEED_	High: MOUNT_CAP(robot_input, robot_o Lows: wait(?robot_input, "?station/" Lows: prepare_station(?robot_input, bring_product_to(?robot_input,	'el) g	
:parameter			
:precondit	High: MOUNT_CAP(robot_input, robot_o Lows: wait(?robot_output, "?station/ Lows: get_product_from(?robot_output	'el)	
(into_			
(robot	High: MOUNT_CAP_ALONE(robot, station	'el)	
(manag	Lows: wait(?robot, "?station/" + ?st	'el)	
(gripp	Lows: prepare_station(?robot, ?stati	'el)	
(witho	bring_product_to(?robot, "plac	'el)	
(bases			
(one_m	High: DELIVER(robot, station, side,	'el)	
(ready	High: MOUNT_CAP_ALONE(robot, station	'el)	
)	Lows: wait(?robot, "?station/" +		
:effect (a	Lows: prepare_station(?robot, ?stati		
(not (	bring_product_to(?robot, "plac	gent_name	
(bases	?play_sound/etc/ff7fanfare.wav	/1/status	

External  
solver

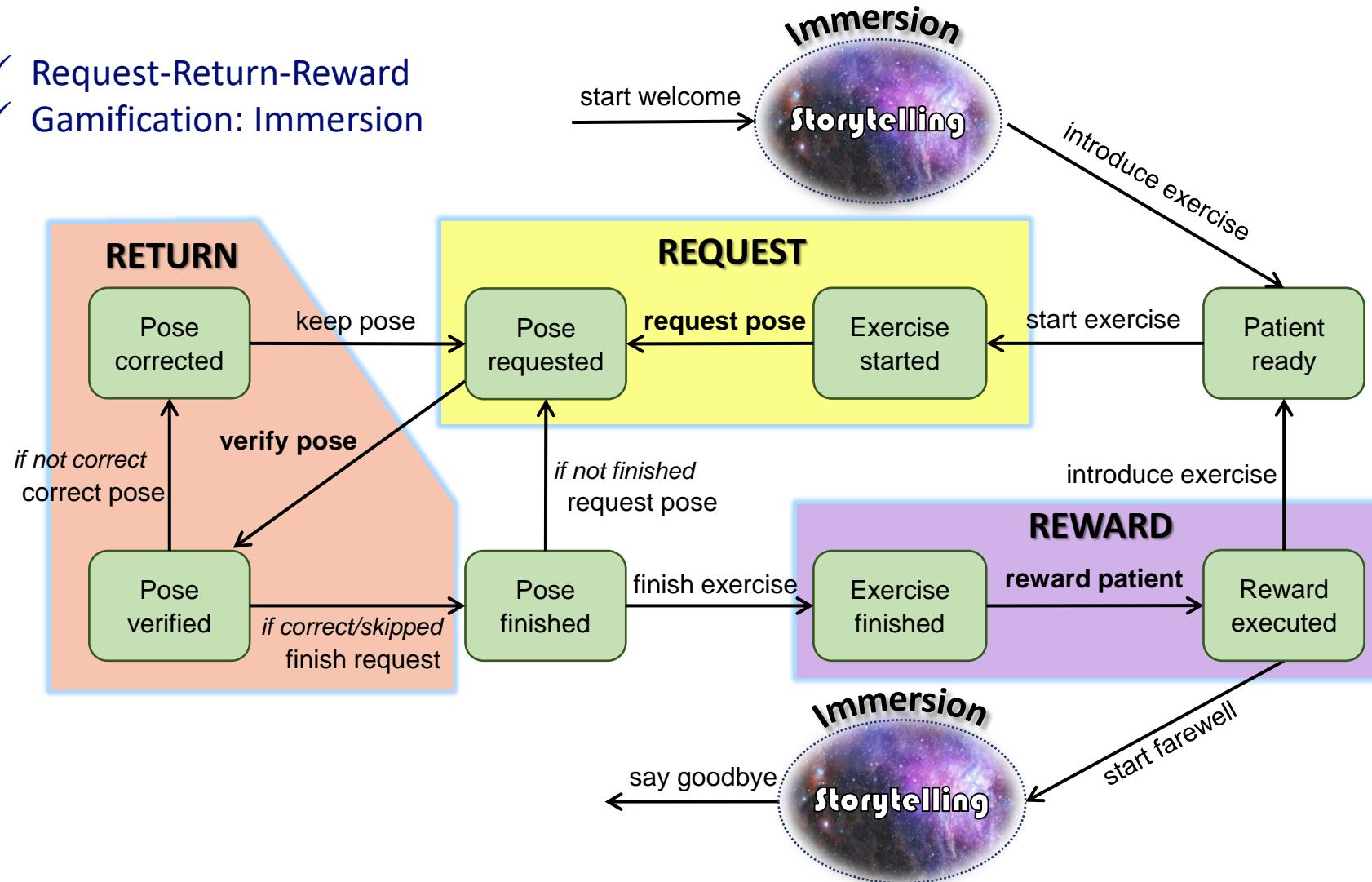
Model  
state

Purative  
conditions

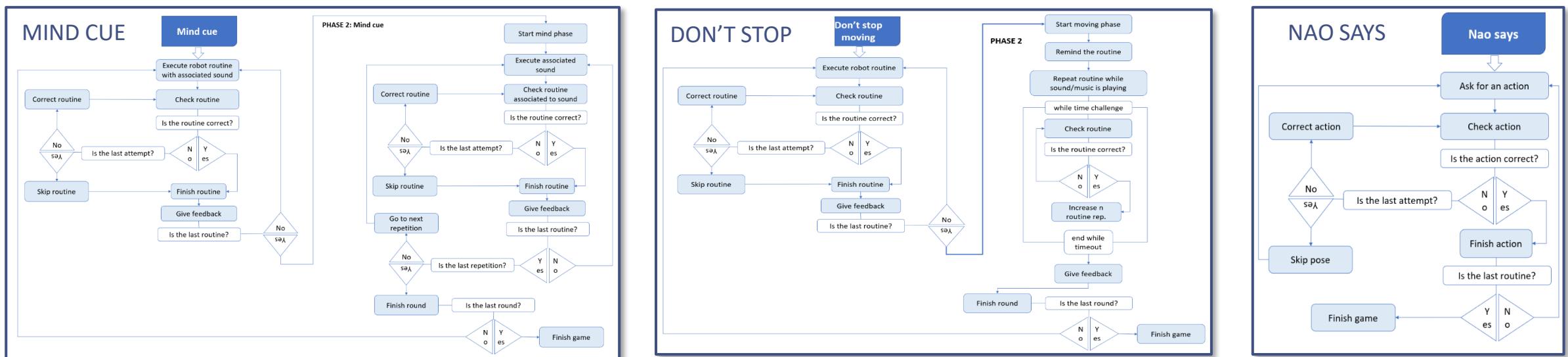
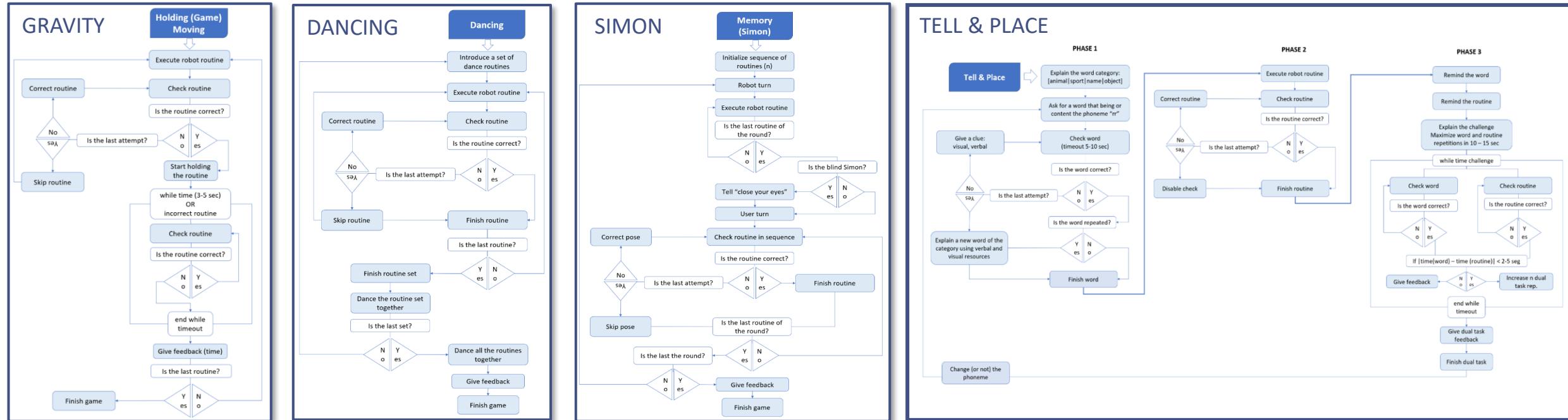
Action  
impositions

# INTERACTION FLOW

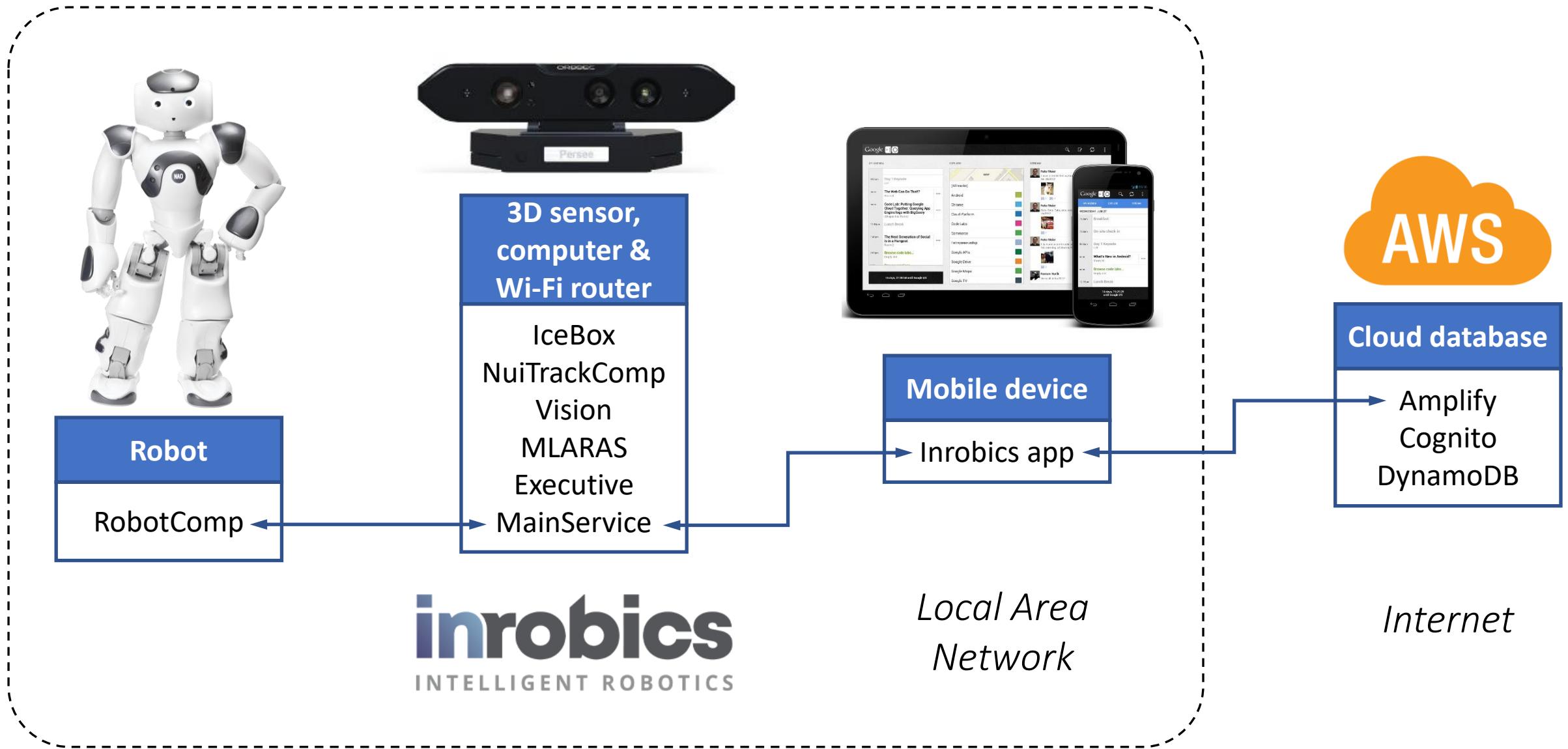
- ✓ Request-Return-Reward
- ✓ Gamification: Immersion



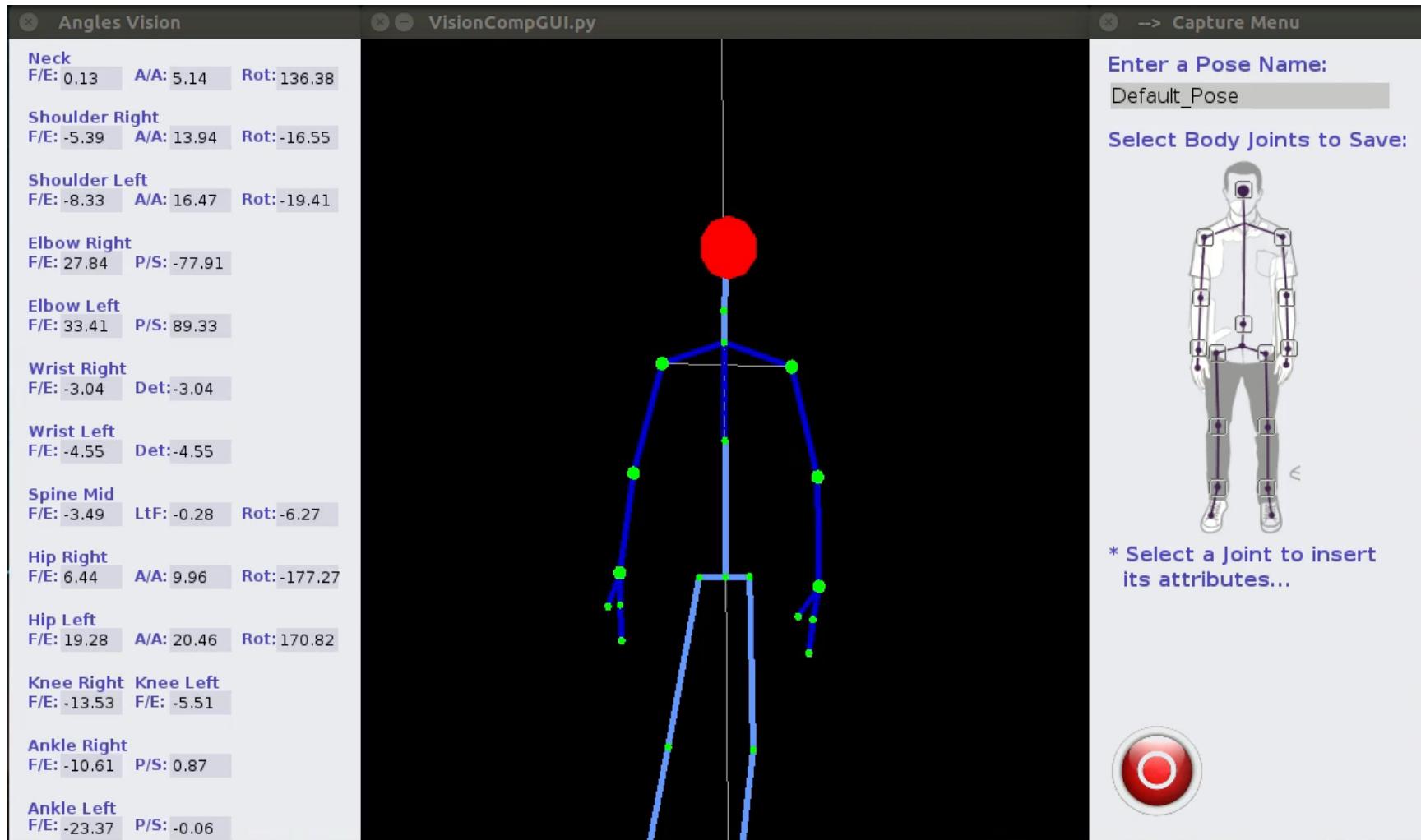
# THERAPEUTIC ACTIVITIES



# INROBICS PLATFORM OVERVIEW



# PERCEPTION SYSTEM



## CHECK ROUTINES



- Dynamic or static
- Touch
- Body state

## USER ADAPTATION



- Patient thresholds
- Joint significance

An anthropometric model in terms of range of mobility  
of each joint according to human beings

Inrobics

Eltarys Larrad Ginard  
Clínica Carlos III de Madrid

SOLO

Buscar

Albert Medina Sanz 51 años  
Brachial Plexus Palsy Ning. afec.  
Tutor: María Antonia Sanz  
Sesiones: 3s 22/27 Últ. hace 1 días

Amparo Moreno Bravo 51 años  
Cerebral Palsy Der. afec.  
Tutor: Carolina Bravo  
Sesiones: 4s 42/54 Últ. hace 1 días

Ana Belén Reyes Ramí... 51 años  
Down Syndrome Der. afec.  
Tutor: Samuel Reyes  
Sesiones: 2s 86/102 Últ. hace 10 días

Catalina López Gallego 51 años  
Down Syndrome Der. afec.  
Tutor: Gabriel López  
Sesiones: 4s 14/41 Últ. hace 16 días

Concepción Martín Vic... 51 años  
Brachial Plexus Palsy Izq. afec.  
Tutor: Fernando Martín  
Sesiones: 3s 15/70 Últ. hace 13 días

Emilio Castro Díaz 51 años  
Down Syndrome  
Tutor: María Jesús Díaz  
Sesiones: 3s 21/20 Últ. hace 2 días

Albert Medina Sanz

INFO PLAN CUERPO JUEGOS

LOGO (logopedia) ..... 3 - +  
NPS (neuropsicología) .. 0 - +  
PSIC (psicoterapia) ..... 0 - +

Terapias complementarias

- Punciación seca  F. Respiratoria
- Psicomotricidad  CIMT
- A. temprana  Kinesiotape
- I. sensorial  Wii
- Therasuit  Realidad virtual
- Musicoterapia  Inrobics
- Hipoterapia  Robótica asistencial
- Deporte Adaptado

Productos de apoyo

- Andador  DAFO/Tobillera
- Muletas  Ratón adaptado
- Bastón  SAAC
- Adaptación escritura

Albert Medina Sanz

SESIÓN TRACKING JUEGO

Sesión actual  
23

5 sesiones restantes

CONFIGURAR SESIÓN

INICIAR SESIÓN

Falta configurar la sesión

Albert Medina Sanz

RAZ. CLÍNICO VERIFICAR

Límites de hombro

Izquierdo 180° Derecho 32°

Miembros superiores

MSI 50% MSD La carga de trabajo será la misma en los dos brazos

Dificultad

Fácil 50% Difícil Dificultad intermedia, con un número medio de elementos por rutina

Implicación de piernas

Sedes. Biped. ayuda Biped. Máxima La implicación de los miembros inferiores será media

Planificar ejercicios

Número de ejercicios 2 +

Duración total estimada: 10-15 minutos

## DynamoDB

Panel

### Tablas

Copias de seguridad

Capacidad reservada

Exportaciones a S3

Editor PartiQL

Preferencias

## DAX

Panel

Clústeres

Grupos de subredes

Grupos de parámetros

Eventos

aws<sup>on</sup>activate

Patient-lbvann6rhfcyjdderil6bcdpza-dev Cerrar

Información general Elementos Métricas Alarmas Capacidad Índices Tablas globales Más

Crear elemento Acciones

Examen: [Tabla] Patient-lbvann6rhfcyjdderil6bcdpza... Mostrando 1 de 5 elementos

Examen [Tabla] Patient-lbvann6rhfcyjdderil6bcdpza-dev: id

+ Añadir filtro

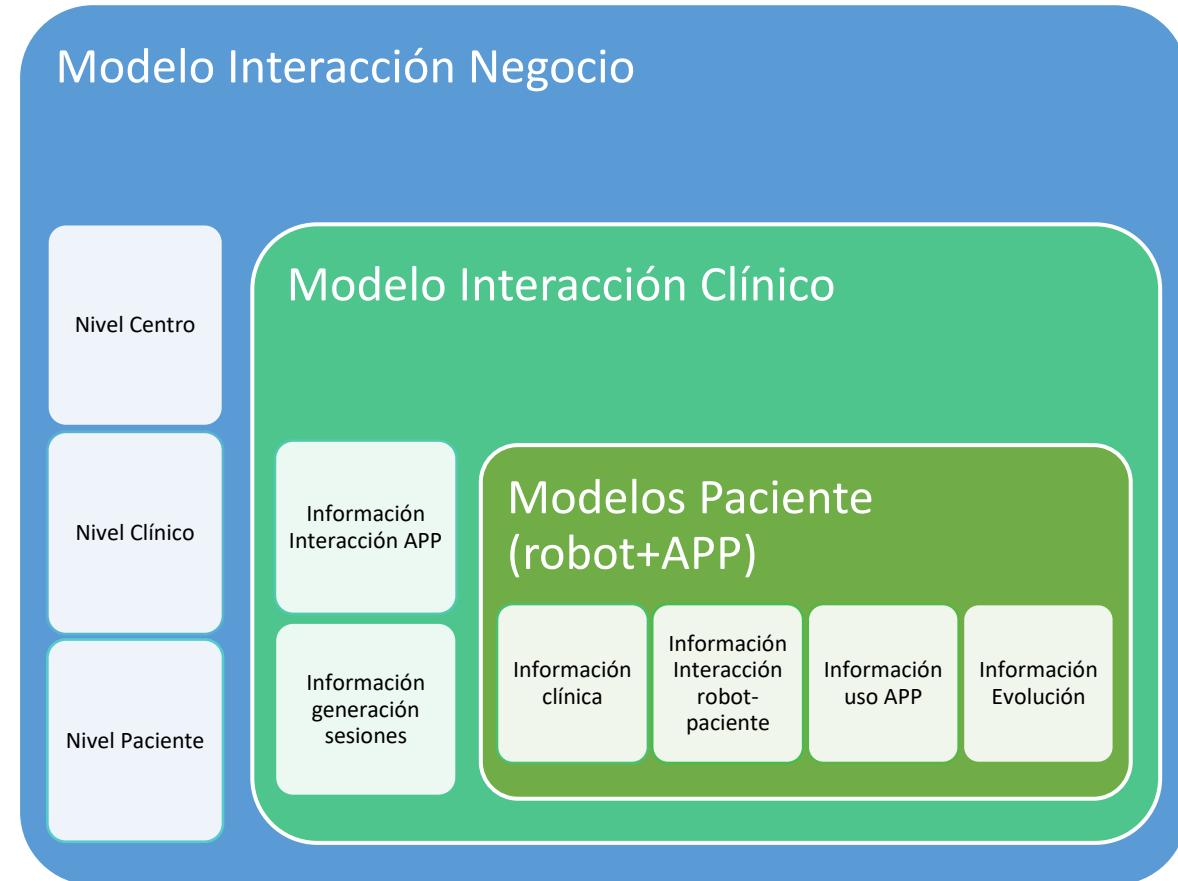
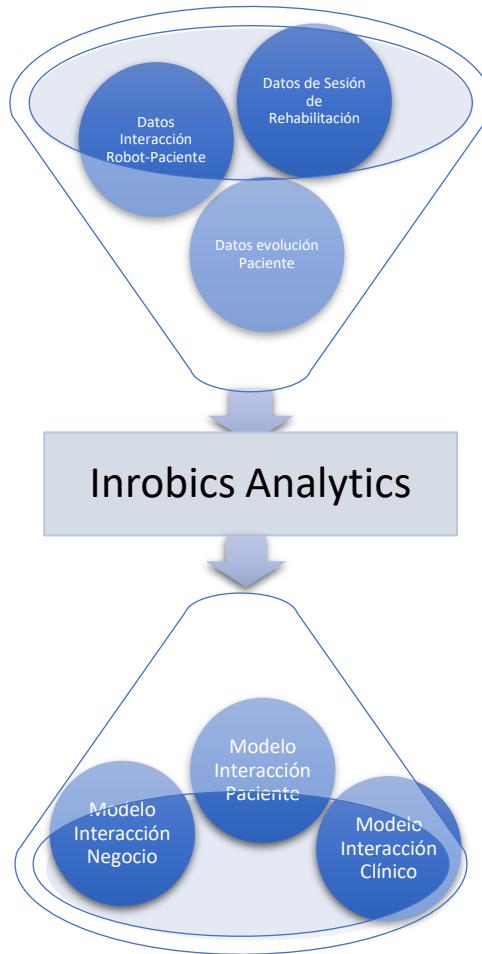
Iniciar búsqueda

	id	_typename	affection_side	birth_date	createdAt
<input type="checkbox"/>	3dad542f-8e7b-40d9-9830-b3c3207cd65c	Patient	Left	10/02/1922	2021-05-03T15:49:41-05:00
<input type="checkbox"/>	87118549-d3de-4352-827b-f3bf2566d3e6	Patient	Left	10/02/1996	2021-05-03T15:10:21-05:00
<input type="checkbox"/>	982d8846-9aa2-4627-9738-2abfa588c0e4	Patient	Left	10/02/1976	2021-05-03T15:11:21-05:00

Planned AWS AI support

- Alexa audio interfaces integrated with rehabilitation games
- Detect possible improvements in the patient's treatment
- Detect business opportunities in the usage of the platform

# Business Intelligence





inrobics

Fecha de sesión

22/12/2021

20/11/2023

Fecha de sesión

Úl... 2 Meses

22/09/2023 - 21/11/2023

owner

ceatte

hsjdsevilla

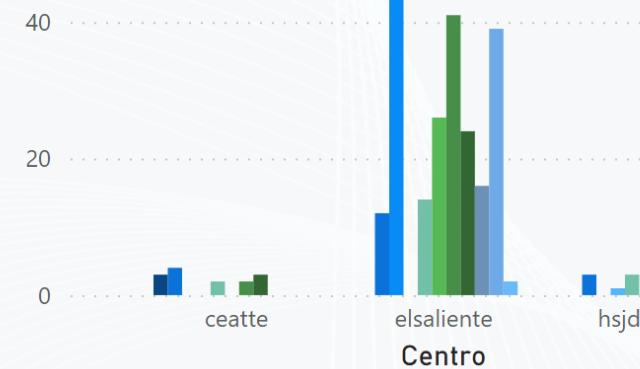
elsaliente

56

Número de sesiones

### Número de ejercicios

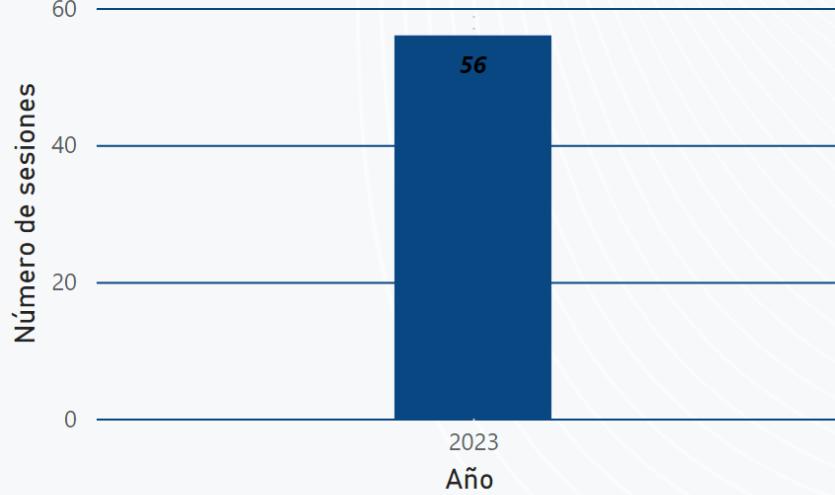
avd dance dontStop eval dynamic warmup



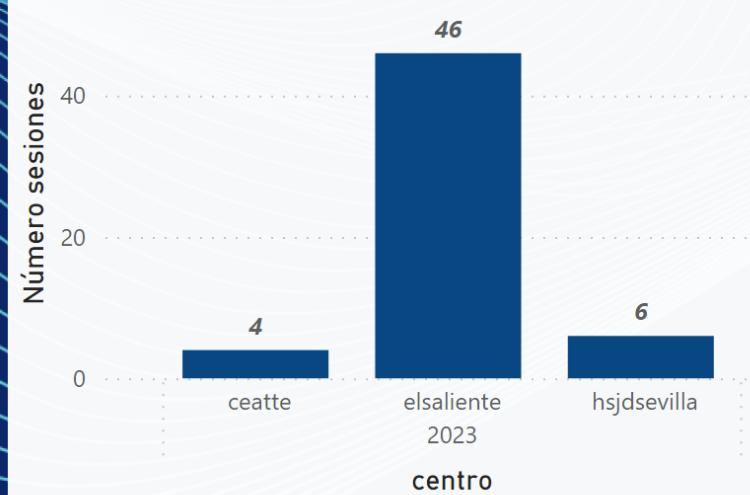
### Número de sesiones totales por mes-año



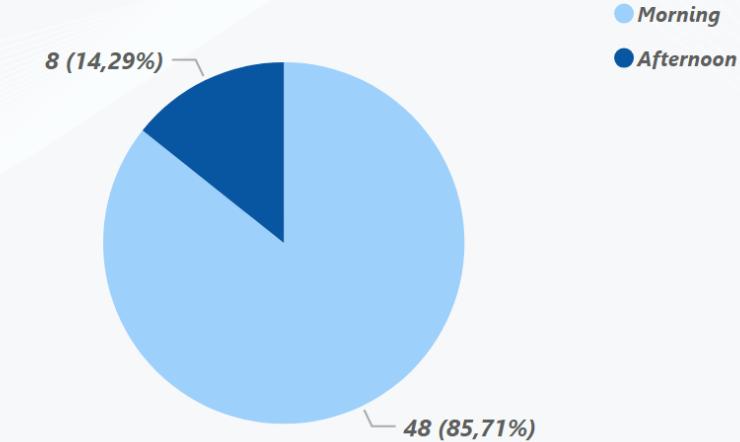
### Número de sesiones totales por año



### Número de sesiones totales por centro y año



### Periodo del día





**inrobics**

Fecha de sesión

22/12/2021

20/11/2023

Fecha de sesión

Úl... 2 Meses

22/09/2023 - 21/11/2023

owner

ceatte

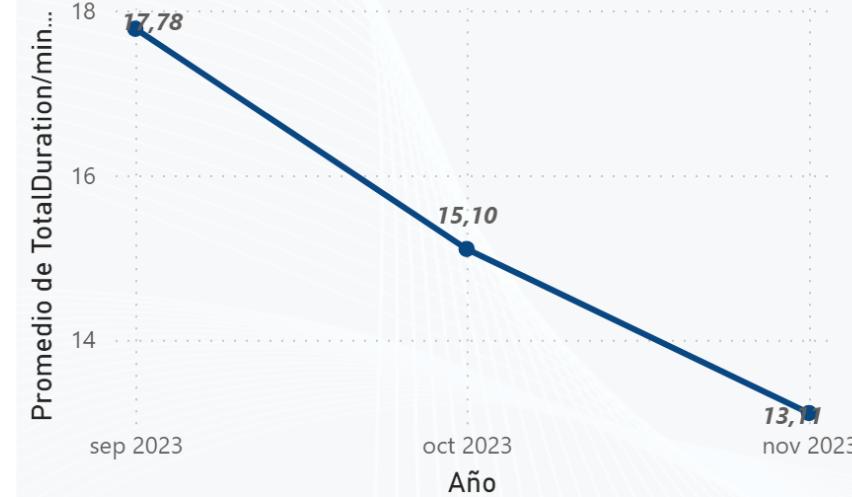
hsjdsevilla

elsaliente

**56**

Número de sesiones

### Promedio de duración de sesiones



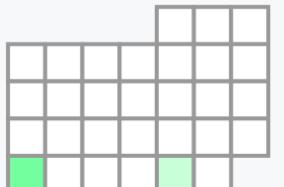
### Número de sesiones totales por mes-año



### Número de sesiones por fecha

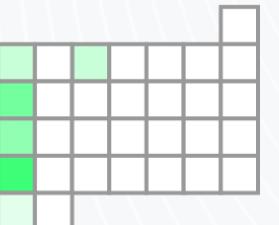
SEP 2023

Mo Tu We Th Fr Sa Su



OCT 2023

Mo Tu We Th Fr Sa Su

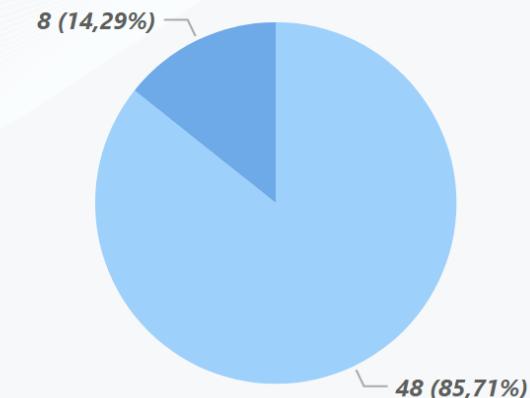


NOV 2023

Mo Tu We Th Fr Sa Su



### Periodo del día



Morning

Afternoon



a de sesión

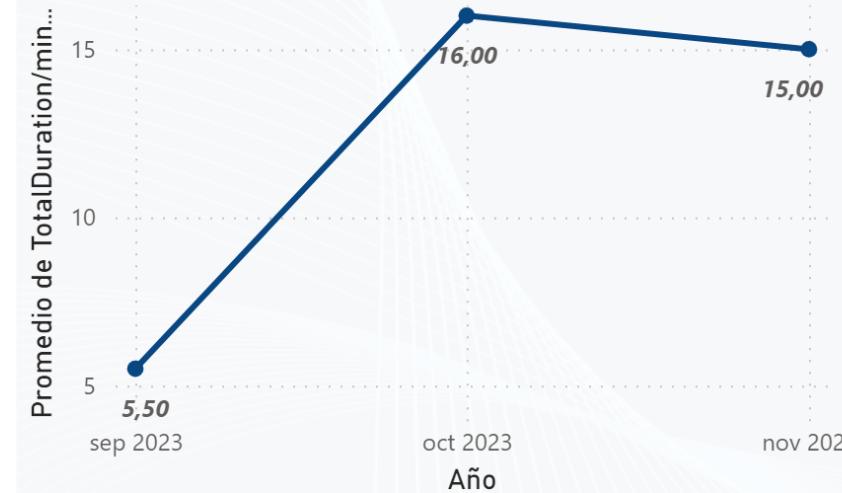
22/12/2021



20/11/2023



### Promedio de duración de sesiones



owner

elsaliente

Caída detectada

FallDetected

Temperatura alta

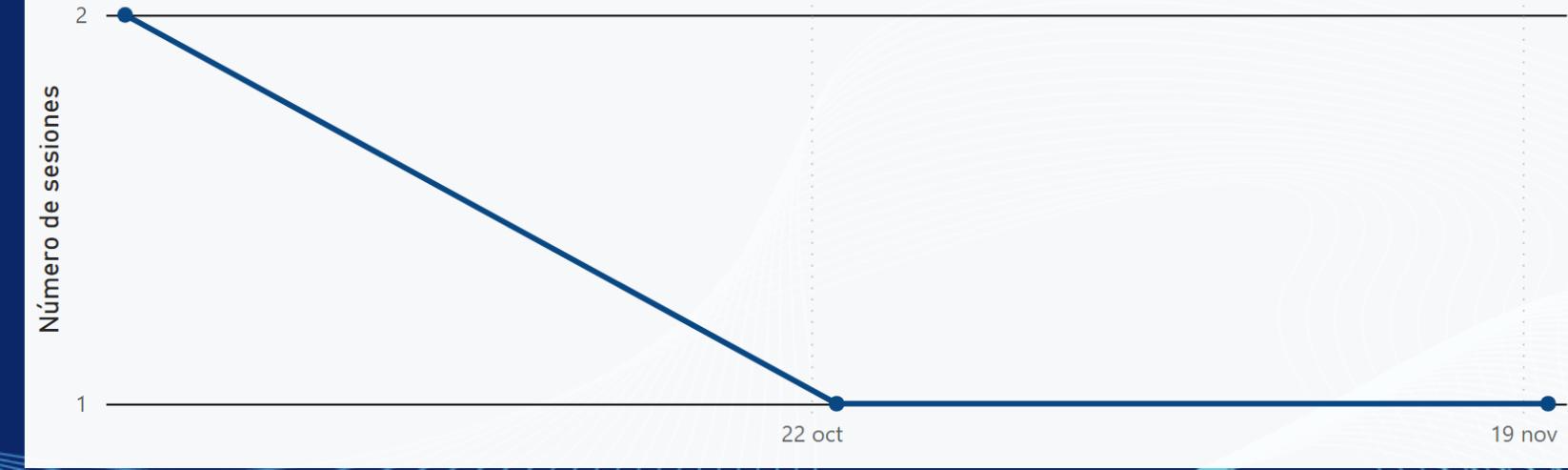


inrobics

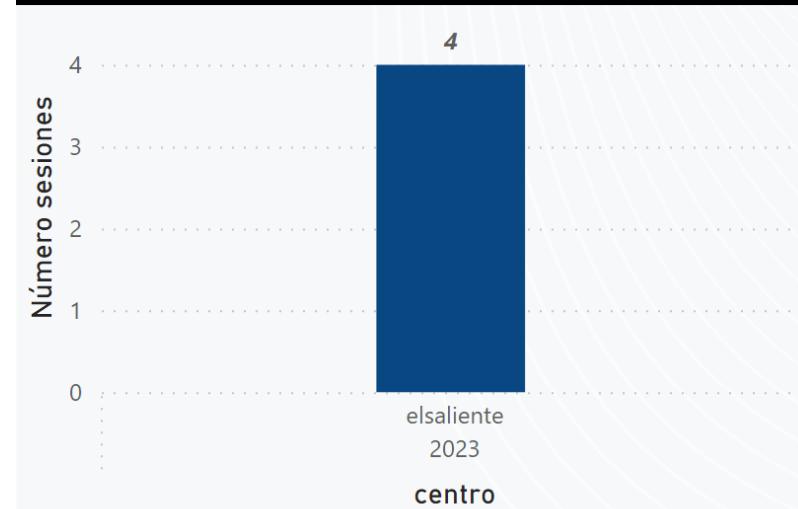
4

Número de sesiones

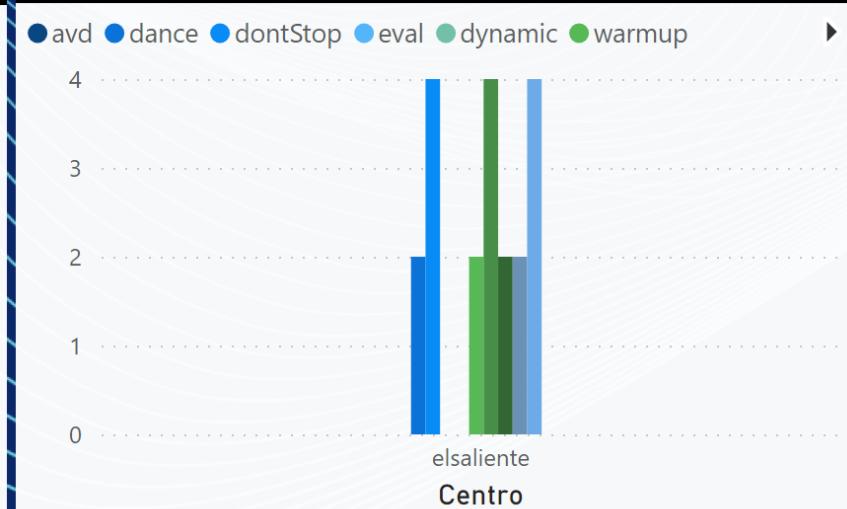
### Número de sesiones totales por mes-año



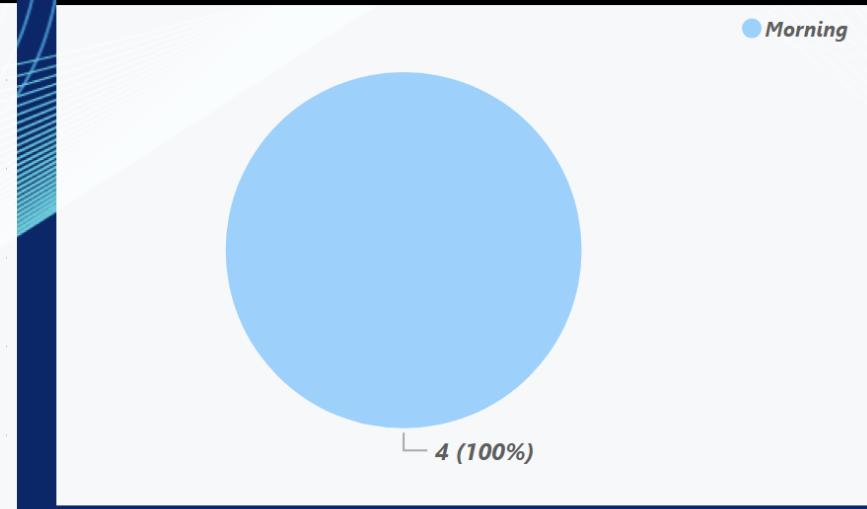
### Número de sesiones totales por centro y año



### Número de ejercicios



### Periodo del día

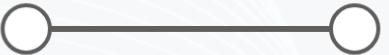


Fecha de sesión

08/11/2021



20/11/2023



centro

ceadac

ceadacpilot2023

ceatte

elsaliente

esment

fisj

fisjcdia

hnpt

hsjdsevilla

inrobicsdemos

Inpacifico

lorenahc

967

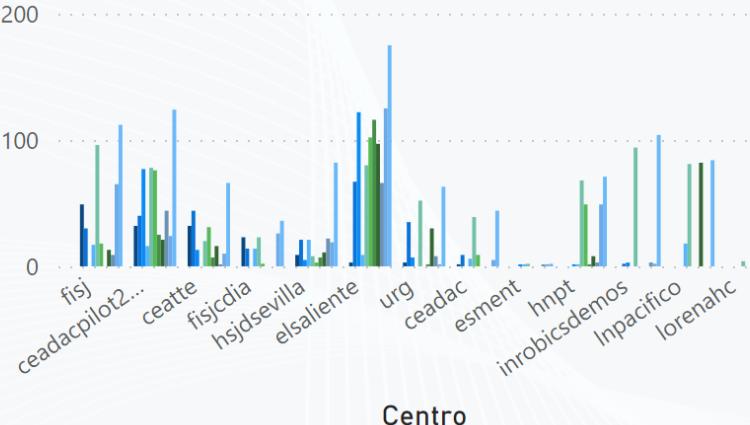
Número de sesio...



inrobics

## Número de ejercicios

avd dance dontStop eval dynamic warmup



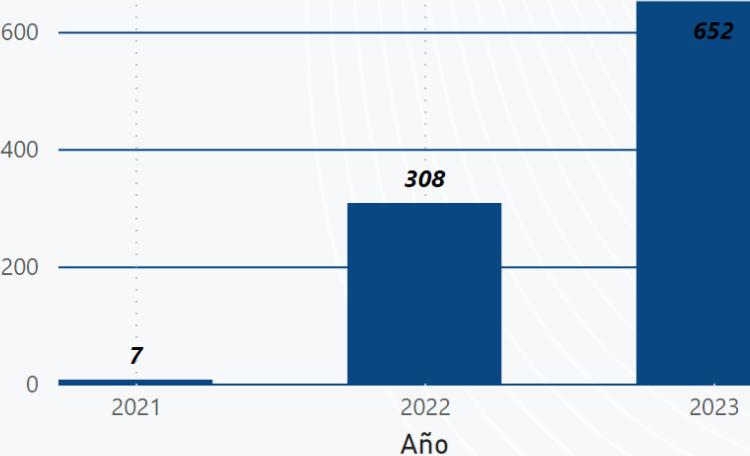
## Número de sesiones totales por mes-año

Número de sesiones



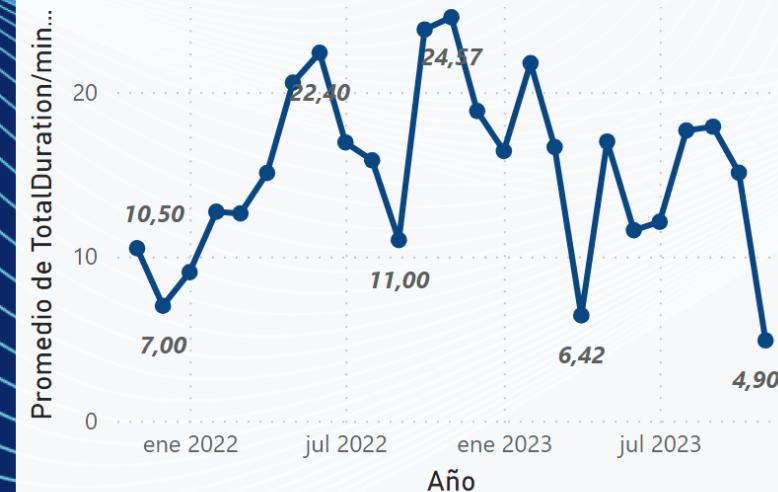
## Número de sesiones totales por año

Número de sesiones

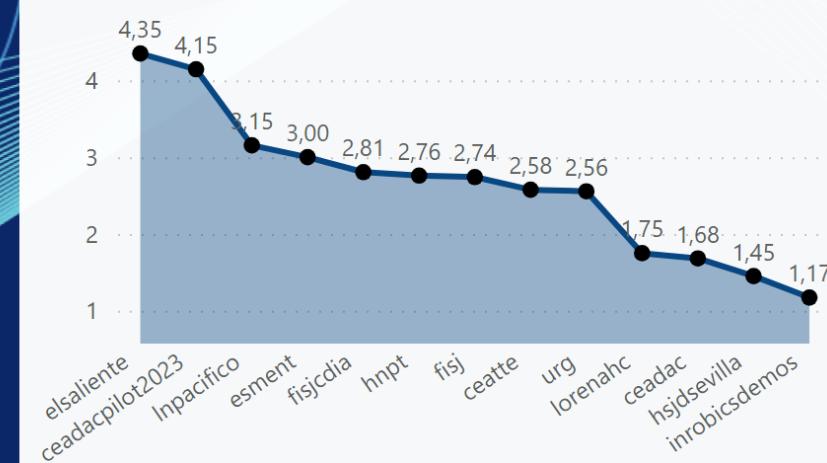


## Promedio de duración de sesiones

Promedio de TotalDuration/min...



## Media de ejercicios por cliente



Fecha de sesión

08/11/2021

20/11/2023

centro

ceadac	ceatte	esment	fisjcdia	hsjdsevilla	Inpacifico
ceadacpilot2023	elsaliente	fisj	hnpt	inrobicsdemos	lorenahc

967

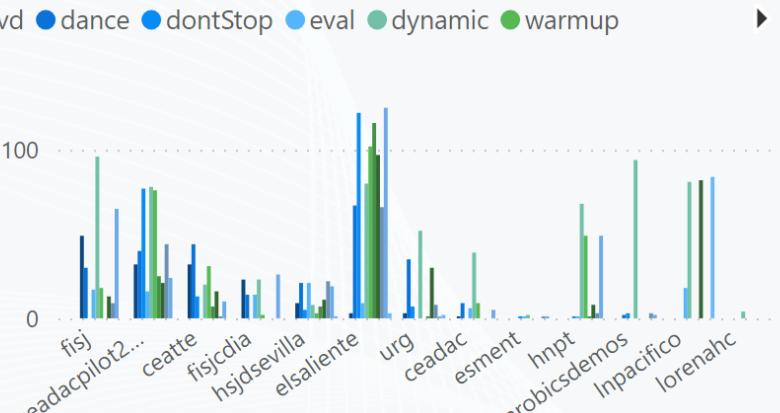
Número de sesio...



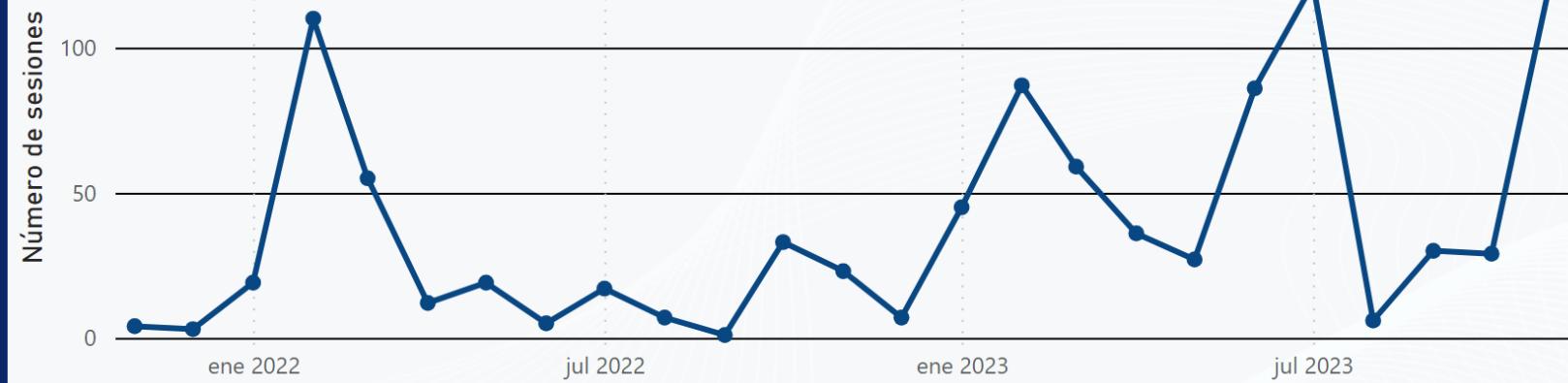
inrobics

### Número de ejercicios

avd dance dontStop eval dynamic warmup

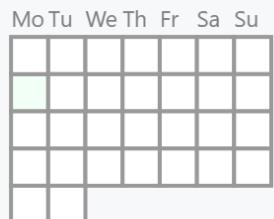


### Número de sesiones totales por mes-año



### Número de sesiones por fecha

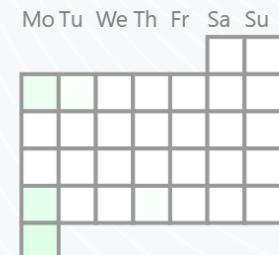
NOV 2021



DEC 2021



JAN 2022



FEB 2022



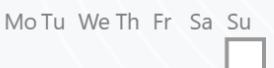
MAR 2022



APR 2022



MAY 2022



JUN 2022



JUL 2022



AUG 2022



### Media de ejercicios por cliente





# NAOTherapist Evaluation

# Chronology of Evaluation

NAOTherapist Evaluation > Chronology of Evaluation

	First Contact				Long term adherence	Intensive therapy
	1 <sup>st</sup> Phase		2 <sup>nd</sup> Phase	3 <sup>rd</sup> Phase	4 <sup>th</sup> Phase	
	Oct 2014 – Feb 2015		Feb 2015	Nov 2015 - March 2016	July 2017	
Evaluation	Clinical settings	X	✓	✓	✓	
	Participants	117	3	8	10	
	Condition	TD	OBPP/CP	OBPP/CP	CP	
	Sessions	1	1	12	11	
	Frequency	-	-	weekly	daily	
	Autonomy	✓	✓	✓	✓	
	Perception	✓	✓	✓	✓	
	Adaptation	X	X	✓	✓	
	Configuration	X	X	X	✓	
	Gamification	X	X	X	✓	
System	Reward	X	X	✓	✓	
	Mirror	✓	✓	✓	✓	
	Memory	X	X	✓	✓	
	NAO says	X	X	X	✓	
	Dance w NAO	X	X	X	✓	
	Teach me	X	X	X	✓	
SAR-based Activities						

# Chronology of Evaluation

NAOTherapist Evaluation > Chronology of Evaluation

	First Contact		Long term adherence	Intensive therapy
	1 <sup>st</sup> Phase	2 <sup>nd</sup> Phase	3 <sup>rd</sup> Phase	4 <sup>th</sup> Phase
	Oct 2014 – Feb 2015	Feb 2015	Nov 2015 - March 2016	July 2017
Clinical settings	X	✓	✓	✓
Participants	117	3	8	10
Condition	TD	OBPP/CP	OBPP/CP	CP
Sessions	1	1	12	11
Frequency	-	-	weekly	daily
Autonomy	✓	✓	✓	✓
Perception	✓	✓	✓	✓
Adaptation	X	X	✓	✓
Configuration	X	X	X	✓
System	<b>Ev 1. Active interaction</b> <ul style="list-style-type: none"> <li>▪ First large-scale evaluation</li> </ul>		Lesson learned: “Sometimes, less is more”	
Ad Activities	Memory	X	X	✓
SAR	Teach me	X	X	✓
	A less sophisticated platform get much better results in terms of a fluent interaction			
uc3m   Universidad Carlos III de Madrid	Ph.D. Computer Science and Technology			

# Chronology of Evaluation

NAOTherapist Evaluation > Chronology of Evaluation

	First Contact		Long term adherence	Intensive therapy
	1 <sup>st</sup> Phase	2 <sup>nd</sup> Phase	3 <sup>rd</sup> Phase	4 <sup>th</sup> Phase
	Oct 2014 – Feb 2015	Feb 2015	Nov 2015 - March 2016	July 2017
Evaluation				
Clinical settings	X	✓	✓	✓
Participants	117	3	8	10
Condition	TD	OBPP/CP	OBPP/CP	CP
Sessions	1	1	12	11
Frequency	-	-	weekly	daily
Autonomy	✓	✓	✓	✓
Perception	✓	✓	✓	✓
Adaptation	X	X	✓	✓
Configuration	X	X	X	✓
System				
Ev 2. Patient engagement	<ul style="list-style-type: none"> <li>▪ <u>Useful for diagnosis</u></li> </ul> <p>Lesson learned: “Every patient is a world”</p>			
SAR-based Activities				
Memory	X	X	✓	✓
NAO says	X	X	X	✓
Dance w NAO	Start working on adaptation mechanisms			✓
Teach me	X	X	X	✓

# Chronology of Evaluation

NAOTherapist Evaluation > Chronology of Evaluation

	First Contact		Long term adherence	Intensive therapy
	1 <sup>st</sup> Phase	2 <sup>nd</sup> Phase		
	Oct 2014 – Feb 2015	Feb 2015	Nov 2015 - March 2016	July 2017
Evaluation	Clinical settings	X	✓	✓
	Participants	117	3	8
	Condition	TD	OBPP/CP	OBPP/CP
	Sessions	1	1	12
	Frequency	-	-	weekly
	Autonomy	✓	✓	✓
	Perception	✓	✓	✓
	Adaptation	X	X	✓
	Configuration	X	X	✓
	Ev 3. Long-term adherence	<ul style="list-style-type: none"> <li>First evaluation providing clinical outcomes</li> </ul> <p>Lesson learned: “Novelty effect”</p>		
Used Activities	Memory	X	✓	✓
	NAO says	X	X	✓
<p>Enrich the activities, behaviors and rewards of the robot by including gamification</p>				
SA	Teach me	X	X	X

# Chronology of Evaluation

NAOTherapist Evaluation > Chronology of Evaluation

	First Contact		Long term adherence	Intensive therapy
	1 <sup>st</sup> Phase	2 <sup>nd</sup> Phase	3 <sup>rd</sup> Phase	4 <sup>th</sup> Phase
	Oct 2014 – Feb 2015	Feb 2015	Nov 2015 - March 2016	July 2017
				
Evaluation	X	✓	✓	✓
Participants	117	3	8	10
Condition	TD	OBPP/CP	OBPP/CP	CP
Sessions	1	1	12	11
Frequency	-	-	weekly	daily
Autonomy	✓	✓	✓	✓
Perception	✓	✓	✓	✓
Adaptation	X	X	✓	✓
Configuration	X	X	X	✓
Gamification	X	X	X	✓
System	<b>Ev 4. Intensive therapy</b>		<ul style="list-style-type: none"> <li>▪ <u>First evaluation in intensive therapy</u></li> </ul> <p>Lesson learned: “<b>Every effort has its rewards</b>”</p>	
SAR-based Activities				
NAO says	X	X	X	✓
Dance w NAO	X	X	X	✓
Teach me	X	X	X	✓

# Results

NAOTherapist Evaluation > Results & Discussion



**Usability**

Effectiveness



**Social Acceptance**

Effort Expectancy



**User Experience**



Embodiment



Emotion



Human-oriented perception



Feeling of security



**Societal Impact**



Quality of life



Working conditions

# Enriching Experience

NAOTherapist Evaluation > Enriching Experience



# CONTRIBUTIONS: JCR JOURNALS

- **An Automated Planning Model for HRI: Use Cases on Social Assistive Robotics:** Raquel Fuentetaja, Ángel García-Olaya, Javier García, José Carlos González and Fernando Fernández. *Sensors*, vol. 20(22), p. 6520, MDPI, November 2020, **JCR 2019 impact 3.275 - Q1**, doi:10.3390/s20226520
- **A framework for User Adaptation and Profiling for Social Robotics in Rehabilitation:** Alejandro Martín, José Carlos Pulido, José Carlos González, Ángel García-Olaya and Cristina Suárez, *Sensors*, vol. 20(17), p. 4792, MDPI, August 2020, **JCR 2019 impact 3.275 - Q1**, doi:10.3390/s20174792
- **A Socially Assistive Robotic Platform for Upper-Limb Rehabilitation: A Longitudinal Study With Pediatric Patients:** JC. Pulido, C. Suarez-Mejias, JC. Gonzalez, A. Dueñas, P. Ferrand, M.E. Martinez, C. Echevarria, P. Infante-Cossio, C. Luis Parra and F. Fernandez. *IEEE Robotics & Automation Magazine (IEEE RAM)*, vol. 1, pp. 1-16, IEEE April 2019, **JCR 2017 impact 3.573 – Q1**, doi:10.1109/MRA.2019.2905231.
- **Socially Assistive Infant-Robot Interaction: Using Robots to Encourage Infant Leg-Motion Training:** N. Fitter, R. Funke, JC. Pulido, L. E Eisenman, W. Deng, M. R Rosales, N. Bradley, B. Sargent, B. Smith, M. J Mataric. *IEEE Robotics & Automation Magazine (IEEE RAM)*, vol. 1, pp. 1-16, IEEE April 2019, **JCR 2017 impact 3.573 – Q1**, doi:10.1109/MRA.2019.2905231.
- **Developing a Robot-Guided Interactive Simon Game for Physical and Cognitive Training:** Misra Turp, José Carlos González, José Carlos Pulido and Fernando Fernández. *International Journal of Humanoid Robotics (IJHR)*, vol. 19(1), p. 195003, World Scientific, February 2019, **JCR 2017 impact 0.908 - Q4**, doi:10.1142/S0219843619500038.
- **Evaluating the Child–Robot Interaction of the NAOTherapist Platform in Pediatric Rehabilitation:** José Carlos Pulido, José Carlos González, Cristina Suárez-Mejías, Antonio Bandera, Pablo Bustos and Fernando Fernández. *International Journal of Social Robotics (IJSR)*, vol. 9(3), pp. 343–358, Springer, June 2017, **JCR 2017 impact 2.003 - Q3**, doi:10.1007/s12369-017-0402-2.
- **A three-layer planning architecture for the autonomous control of rehabilitation therapies based on social robots:** José Carlos González, José Carlos Pulido and Fernando Fernández. *Cognitive Systems Research (CSR)*, vol. 43, pp. 232-249, Elsevier, June 2017, **JCR 2017 impact 1.425 - Q3**, doi:10.1016/j.cogsys.2016.09.003.

# CONTRIBUTIONS: CONFERENCES & WORKSHOPS

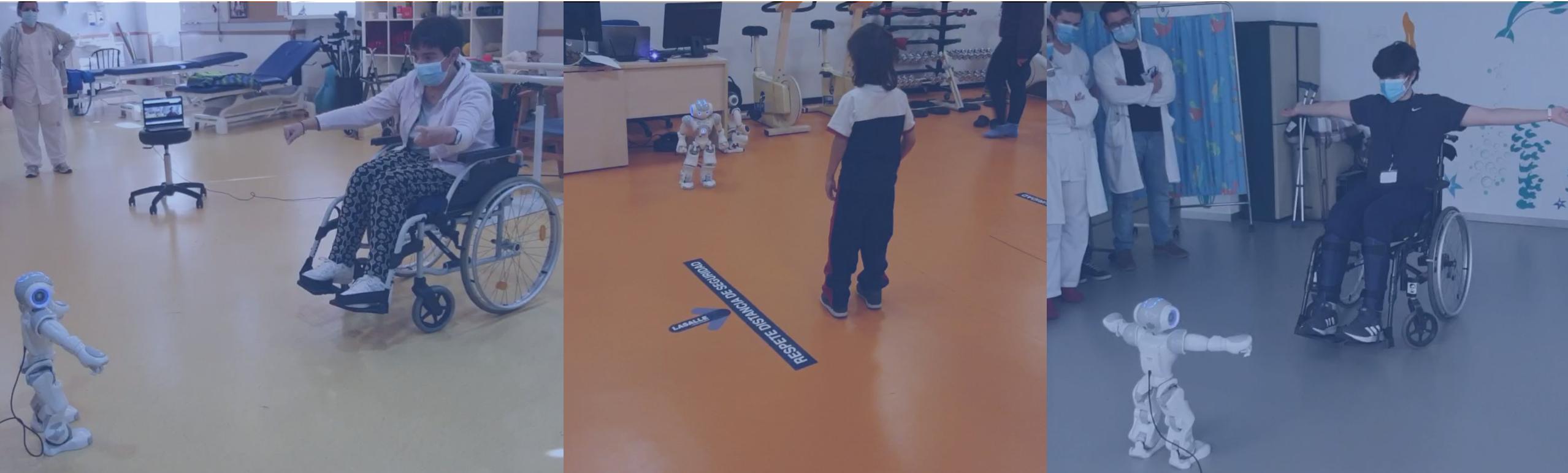
- **Adaptation of the Difficulty Level in an Infant-Robot Movement Contingency Study:** José Carlos Pulido, Rebecca Funke, Javier García, Beth A. Smith and Maja Matarić, on the *3rd Iberian Robotics Conference, (ROBOT 2017), on in proceedings of the 19th Workshop of Physical Agents (WAF)*, pp. 70-83, Madrid (Spain), November 2018.
- **Classifying Infant Motor Development using Day Long Movement Data from Wearable Sensors:** David Goodfellow, Ruoyu Zhi, Rebecca Funke, Jose Carlos Pulido, Maja J. Mataric, Beth A. Smith, on the 2018 KDD Workshop in Machine Learning in Healthcare and Medicine, London (UK), August 2018.
- **Enhancing a Robotic Rehabilitation Model for Hand-Arm Bimanual Intensive Therapy:** Enrique García Estévez, Irene Díaz Portales, José Carlos Pulido, Raquel Fuentetaja and Fernando Fernandez, on the *3rd Iberian Robotics Conference, (ROBOT), Rehabilitation and Assistive Robotics special session*, Seville (Spain), November 2017.
- **NAOTherapist: Autonomous Assistance of Physical Rehabilitation Therapies with a Social Humanoid Robot:** José Carlos Pulido, José Carlos González and Fernando Fernández, in proceedings of the International Workshop on Assistive & Rehabilitation Technology (IWART), pp. 15-16, Elche (Spain), December 2016.
- **Playing with Robots: An Interactive Simon Game:** Misra Turp, José Carlos Pulido, José Carlos González, Fernando Fernández, in *proceedings of the Workshop on Social Robotics and Human-Robot Interaction (RSIM), CAEPIA 2015 Albacete (Spain)*, 2015.
- **Therapy Monitoring and Patient Evaluation with Social Robots:** Alejandro Martín, José Carlos González, José Carlos Pulido, Ángel García-Olaya, Fernando Fernández and Cristina Suárez-Mejías, in *proceedings of the 3rd Workshop on ICTs for improving Patients Rehabilitation Research Techniques, REHAB 2015 Lisbon (Portugal)*, 2015.
- **Planning, Execution and Monitoring of Physical Rehabilitation Therapies with a Robotic Architecture:** José Carlos González, José Carlos Pulido, Fernando Fernández and Cristina Suárez-Mejías, in *proceedings of the 26th Medical Informatics Europe conference (MIE), Studies in Health Technology and Informatics*, vol. 210, pp. 339-343, Madrid (Spain), 2015.
- **Goal-directed Generation of Exercise Sets for Upper-Limb Rehabilitation:** José Carlos Pulido, José Carlos González, Arturo González-Ferrer, Javier García, Fernando Fernández, Antonio Bandera, Pablo Bustos and Cristina Suárez, in *proceedings of the 5th Workshop on Knowledge Engineering for Planning and Scheduling (KEPS)*, ICAPS conference, pp. 38-45, Portsmouth (New Hampshire, USA), 2014.

- [Alami et al. 1998] Alami, R., Chatila, R., Fleury, S., Ghallab, M., and Ingrand, F. (1998). An Architecture for Autonomy. *The Int. Journal of Robotics Research*, 17:pp.315–337
- [Alcázar et al. 2010] Alcázar, V., Guzmán, C., Prior, D., Borrajo, D., Castillo, L., and Onaindia, E. (2010). PELEA: Planning, Learning and Execution Architecture. In Proceedings of the 28th Workshop of the UK Planning and Scheduling Special Interest Group (PlanSIG), Brescia, Italy
- [Bustos et al. 2019] Bustos García, P., Manso Argüelles, L., Bandera, A., Bandera, J., García-Varea, I., and Martínez-Gómez, J. (2019). The CORTEX cognitive robotics architecture: Use cases. *Cognitive Systems Research*, 55:107 – 123
- [Cashmore et al. 2015] Cashmore, M., Fox, M., Long, D., Magazzeni, D., Ridder, B., Carreraa, A., Palomeras, N., Hurtós, N., and Carrerasa, M. (2015). Rosplan: Planning in the robot operating system. In Proceedings of the Twenty-Fifth International Conference on Int. Conference on Automated Planning and Scheduling, ICAPS’15, pages 333–341.
- [Chen et al. 2010] Chen, D.-S.; Batson, R. G.; and Dang, Y. (2010). *Applied Integer Programming: Modeling and Solution*. John Wiley & Sons
- [García et al. 2017] García Estévez, E., Díaz Portales, I., Pulido, J. C., Fuentetaja, R., and Fernández, F. (2017). Enhancing a Robotic Rehabilitation Model for Hand-Arm Bimanual Intensive Therapy. In Proceedings of the 3rd Iberian Robotics Conference.

- [Ghallab et al. 2004] Ghallab, M., Nau, D., and Traverso, P. (2004). Automated planning: theory & practice. Elsevier
- [Ghallab et al. 2014] Ghallab, M., Nau, D., and Traverso, P. (2014). The Actor's View of Automated Planning and Acting: A Position Paper. *AI*, 208:1– 17
- [Kortenkamp et al. 2008] Kortenkamp, D. and Simmons, R. (2008). Springer Handbook of Robotics - Chapter 8, pages 187–206. Springer Berlin Heidelberg
- [McGann et al. 2008] McGann, C., Py, F., Rajan, K., Thomas, H., Henthorn, R., and McEwen, R. (2008). A deliberative architecture for auv control. In 2008 IEEE International Conference on Robotics and Automation, pages 1049–1054.
- [Ögren et al. 2018] Ögren, P. and Colledanchise, M. (2018). Behavior Trees in Robotics and AI: An Introduction. Number 6 in Chapman & Hall/CRC artificial intelligence and robotics series. CRC Press

# ARE YOU READY FOR THE NEXT REVOLUTION IN REHAB?

See more at [www.inrobics.com](http://www.inrobics.com)



Our Partners:

**healthstart**  
madrid

Caixa **impulse**

MOBILE  
WORLD CAPITAL™  
BARCELONA

uc3m | Universidad **Carlos III** de Madrid

José Carlos Pulido Pascual  
+34 637 56 04 39  
jc.pulido@inrobics.com

# WHY TO JOIN US?

**1**

Innovators  
with high  
expertise



**2**

Growing  
sector



**3**

Scalability &  
high-impact



**4**

Specialized &  
regulated



*“Together we can make healthcare more  
accessible and effective to all users”*

# TESTIMONIALS

Click to see the video



**Lorena Rodríguez**  
**Vicepresidenta Fundación DAKER**

**Lucia's mother:**  
“I am really impressed. Lucia has a severe attention deficit and has endured the entire session without blinking.”

## Lucia's therapist:

“NAO helps these patients to have much more motivation and more adherence to treatments. In the end it is a demand that starts from a game between the robot and the child.”



Sonia Gómez

**NAO, EL ROBOT TERAPEUTA**

# INNOVASPAIN

EL PERIÓDICO LÍDER DE LA INNOVACIÓN EN ESPAÑOL

# Quo

# tve



# europa press



# NATIONAL GEOGRAPHIC

# LA VANGUARDIA

# elEconomista.es



# COPE

# Sinc

La ciencia es noticia

# EL PAÍS

