

Dr. Mayra Donaji Barrera Machuca mbarrera@dal.ca

EDUCATION

PhD (Canada, 2019): School of Interactive Arts and Technology (SIAT), Simon Fraser University. *Thesis*: Towards more accurate immersive 3D sketching. GPA: 4.0 / 4.3

MSc (Australia, 2014): School of Technology, Environments and Design, University of Tasmania. *Thesis*: 3D Mobile Interaction with Public Displays. GPA: 6 / 7

BA Animation and Digital Arts, minor in Computer Science (Mexico, 2011): Tecnológico de Monterrey. Honorable Mention (top 10%).

EXPERIENCE

Academic Experience

Associate, Department of Computer Science, Colorado State University (April'22-current, USA)

- Co-supervision of PhD and Master Students

Assistant Professor, Faculty of Computer Science, Dalhousie University (July'21-current, Canada)

- Lead of VERTEX lab
- Tenure-Track.
- Supervision of PhD and Master Students

Postdoctoral Fellow, Simon Fraser University / Virtro (Sept'20-Ago'21, Canada)

- Analyse 3D Spatial-Temporal data to provide better assessment methods to students using Virtro VR applications.

Senior Research Assistant, City University Hong Kong (Feb'20-Jun'20, Hong Kong)

- Prototype, and develop a UI for object design in AR.

Research Assistant, Simon Fraser University (Sep'15-Dec'19; Canada)

- Prototyped, developed, and evaluated (qualitative and quantitative) UIs for VR sketching.
- Used Unity3D and C# for application development, Python and R for data analysis.

Teaching Assistant, Simon Fraser University (Sep'15-Dec'15; Canada)

- IAT 410 - Advanced Game Design.

Sessional Instructor, Universidad Anahuac (Jan'15-May'15; Mexico)

- Programming Fundamentals
- Structured Programming and Objects

Industry Experience

Procedural Imaging Group Intern, Adobe Research (Feb-Apr'17; USA)

- Designed and developed Multiplanes, a UI for sketching in VR.
- Used Unity3D and C# for application development.

Founder (one of four), Baguet Games (Jan '13-Dec'14; Mexico)

- Planned and executed the general business strategy for the company.
- Games: No Chicken Soup Today, Whack a Pollo, Cadabra Shop (Google Play store)

.Net developer, ENHI (Aug-Dec'12; Mexico)

- Developed the system architecture (front-end and connection to back-end) in C# and ASP.Net.

AS3 developer, MapData (Jan-Jul'12; Mexico)

- Developed educational videogames for the Public Education Secretary (SEP) in Mexico, using AS3 and Flash.

PUBLICATIONS

Type	Book Chapters	Journals	Conference Papers	Other Publications
Count	4	2	16	11

Book Chapters

- R. Arora, *M. D. Barrera Machuca*, P. Wacker, D. Keefe and J. H. Israel. 2022. **Interactive Sketch-Based Interfaces and Modelling for Product Design. Chapter 6: Introduction to 3D Sketching.** River Publishers, pp.151-178.
- J. H. Israel, *M. D. Barrera Machuca*, R. Arora, P. Wacker and D. Keefe. 2022. **Interactive Sketch-Based Interfaces and Modelling for Product Design. Chapter 7: Input Processing and Geometric Representations for 3D Sketches.** River Publishers. pp.179-194.
- *M. D. Barrera Machuca*, R. Arora, P. Wacker, D. Keefe and J. H. Israel. 2022. **Interactive Sketch-Based Interfaces and Modelling for Product Design. Chapter 8: Interaction Devices and Techniques for 3DSketching.** River Publishers. pp.195-240.
- P. Wacker, R. Arora, *M. D. Barrera Machuca*, J. H. Israel and D. Keefe. 2022. **Interactive Sketch-Based Interfaces and Modelling for Product Design. Chapter 9: 3D Sketching Application Scenarios.** River Publishers. pp.241-262.

Journal

- *M. D. Barrera Machuca*, J. H. Israel, D. F. Keefe and W. Stuerzlinger. 2023. **Toward More Comprehensive Evaluations of 3D Immersive Sketching, Drawing, and Painting.** IEEE Transactions on Visualization and Computer Graphics (TVCG), May 2023.
- *M. D. Barrera Machuca*, W. Chinthammit, W. Huang, R. Wasinger and H. Duh. 2018. **Enabling Symmetric Collaboration in Public Spaces through 3D Mobile Interaction.** Symmetry 10:3, 69, Mar 2018.

Conference

- A. U. Batmaz, R. Turkmen, M. Sarac, *M.D. Barrera Machuca* and W. Stuerzlinger. 2023. **Effect of Grip Style on Pointing in Head Mounted Displays.** IEEE International Symposium on Mixed and Augmented Reality (ISMAR 2023), accepted
- A. U. Batmaz, R. Turkmen, M. Sarac, *M.D. Barrera Machuca* and W. Stuerzlinger. 2023. **Re-investigating the Effect of the Vergence-Accommodation Conflict on 3D Pointing.** ACM Symposium on Virtual Reality Software (VRST 2023), accepted
- E. Karatas, K. Sunday, S. E. Apak, Y. Li, J. Sun, A. U. Batmaz and *M. D. Barrera Machuca*. 2023. **"I consider VR Table Tennis to be my secret weapon!": An Analysis of the VR Table Tennis Players' Experiences Outside the Lab.** ACM Symposium on Spatial User Interaction (SUI 2023), accepted
- R. You, Y. Zhou, W. Zheng, Y. Zuo, *M. D. Barrera Machuca*, X. Tong. **BlueVR: Design and Evaluation of a Virtual Reality Serious Game for Promoting Understanding towards People with Color Vision Deficiency.** 2023. ACM Symposium on Computer-Human Interaction in Play (CHI Play 2023), accepted.
- P. Reynolds-Cuéllar, M. Wong-Villacres, K. Badillo-Urquiola, *M. D. Barrera Machuca*, F. L. Cibrian, M. Ciolfi Felice, C. Fuentes, L. S. Gaytán-Lugo, V. Genaro Motti, M. Perusquía-Hernández and O. Lemus. 2023. **Para Cima y Pa' Abajo: Building Bridges Between HCI Research in Latin America and in the Global North.** ACM CHI Conference on Human Factors in Computing Systems (CHI 2023) Article 280, 1–19.

- A. U. Batmaz, M. Hudhub Mughribi, M. Sarac, *M.D. Barrera Machuca* and W. Stuerzlinger. 2023. **Measuring the Effect of Stereo Deficiencies on Peripersonal Space Pointing**. IEEE Conference on Virtual Reality and 3D User Interfaces (IEEE VR 2023), pp. 1-11.
- A. U. Batmaz, M. Hudhub Mughribi, *M.D. Barrera Machuca* and W. Stuerzlinger. 2022. **Effect of Stereo Deficiencies on Virtual Distal Pointing**. ACM Symposium on Virtual Reality Software (VRST 2020), Article 12, 1–8
- A. U. Batmaz, *M.D. Barrera Machuca*, J. Sun, W. Stuerzlinger. 2022. **The Effect of the Vergence-Accommodation Conflict on Virtual Hand Pointing in Immersive Displays**. ACM CHI Conference on Human Factors in Computing Systems (CHI 2022) May 2022.
- H. Elsayed, *M.D. Barrera Machuca*, C. Schaarshmidt, K. Marky, F. Müller, J. Riemann, A. Matviienko, M. Schmitz, M. Wiegel and M. Mühlhäuser. 2020. **VRSketchPen: Unconstrained Haptic Assistance for Sketching in Virtual 3D Environments**. ACM Symposium on Virtual Reality Software (VRST 2020), Nov 2020.
- *M. D. Barrera Machuca*, W. Stuerzlinger and P. Asente. 2019. **Smart3DGuides: Making Unconstrained Immersive 3D Drawing More Accurate**. ACM Symposium on Virtual Reality Software (VRST 2019), 1-13, Nov 2019.
- *M. D. Barrera Machuca*, W. Stuerzlinger and P. Asente. 2019. **The Effect of Spatial Ability on Immersive 3D Drawing**. ACM Creativity and Cognition (C&C 2019), 173-186, June 2019.
- *M. D. Barrera Machuca* and W. Stuerzlinger. 2019. **The Effect of Stereo Display Deficiencies on Virtual Hand Pointing**. ACM CHI Conference on Human Factors in Computing Systems (CHI 2019), 1-14, May 2019.
- U. Batmaz, *M. D. Barrera Machuca*, D.M. Pham and W. Stuerzlinger. 2019. **Do Head-Mounted Display Stereo Deficiencies Affect 3D Pointing Tasks in AR and VR?** IEEE Conference on Virtual Reality and 3D User Interfaces (IEEE VR 2019), 585-592, March 2019.
- *M. D. Barrera Machuca*, P. Asente, W. Stuerzlinger, J. Lu and B. Kim. 2018. **Multiplanes: Assisted Freehand VR Sketching**. ACM Symposium on Spatial User Interaction (SUI 2018), 36-47, Oct 2018.
- *M. D. Barrera Machuca*, W. Chinthammit and W. Huang. 2018. **Usability of Information Seeking Tools in 3D Mobile Interaction with Public Displays**. International Conference on Cooperative Design, Visualization and Engineering (CDVE 2018), 16-23, Sept. 2018.
- *M. D. Barrera Machuca*, W. Chinthammit, Y. Yang and H. Duh. 2014. **3D Mobile Interactions with Public Displays**. SIGGRAPH Asia 2014 Mobile Graphics and Interactive Applications (SA 2014), Article 8, 1-4, Dec. 2014

Other Publications

- Quigley A, *Barrera Machuca M*, Pollock C, Lamontagne A, Neyedli N, McDonald A, Dunlop M, Eng JJ. **Protocol for a mixed-methods feasibility study investigating the user experiences of stroke survivors and physiotherapists with omnidirectional treadmill-based virtual reality rehabilitation games**. World Stroke Congress. October 2023
- P. P Hoffmann, H. Elsayed, M. Mühlhäuser, R. R. Wehbe and *M. D. Barrera Machuca*. 2023 **ThermalPen: Adding Thermal Haptic Feedback to 3D Sketching** ACM CHI 2023 Extended Abstracts, Article 474, 1–4.
- R. Turkmen, C. Nwagu, P. Rawat, P. Riddle, K. Sunday and *M. D. Barrera Machuca*. 2023 **Put your glasses on: A voxel-based 3D authentication system in VR using eye-gaze** IEEE VR Abstracts and Workshops, 3DUI contest entry, 947-948.

- R. Turkmen, K. Pfeuffer, *M. D. Barrera Machuca*, A. U. Batmaz, H. Gellersen. 2022 **Exploring Discrete Drawing Guides to Assist Users in Accurate Mid-air Sketching in VR** ACM CHI 2022 Extended Abstracts, May 2022.
- M. Wong-Villacres, A. Alvarado Garcia, K. Badillo-Urquiola, *M. D. Barrera Machuca*, M. Ciolfi Felice, L. S. Gaytán-Lugo, O. Lemus, M. Perusquía-Hernández and P. Reynolds-Cuéllar. 2021. **Lessons from Latin America: Embracing Horizontality to Reconstruct HCI as a Pluriverse**. 28, 2 (March - April 2021), 56–63.
- *M. D. Barrera Machuca*, Alvaro Cassinelli, Christian Sandor. 2020. **Context-Based 3D Grids for Augmented Reality User Interfaces**. Adjunct Publication of ACM UIST 2020, poster, October 2021.
- A. Alvarado García, K. Badillo-Urquiola, *M. D. Barrera Machuca*, F. L. Cibrian, M. Ciolfi Felice, L. S. Gaytán-Lugo, D. Gómez-Zará, C. F. Griggio, M. Perusquía-Hernández, S. Silvia-Prietch, C. E. Tejada, M. Wong-Villacres. 2020. **Fostering HCI Research in, by, and for Latin America**. ACM CHI 2020 Extended Abstracts, May 2020.
- *M. D. Barrera Machuca*, W. Stuerzlinger. 2018. **Do Stereo Display Deficiencies Affect 3D Pointing?** ACM CHI 2018 Extended Abstracts, paper no. LBW126, 1-6, Apr. 2018.
- *M. D. Barrera Machuca*, J. Sun, D. Pham, W. Stuerzlinger. 2018. **Fluid VR: Extended Object Associations for Automatic Mode Switching in Virtual Reality**. IEEE VR 2019, 3DUI contest entry, 846-847, Mar. 2018.
- *M. D. Barrera Machuca*, P. Asente, J. Lu, B. Kim, W. Stuerzlinger. 2017. **Multiplanes: Assisted Freehand VR Drawing**. Adjunct Publication of ACM UIST 2017, demo, 36-47, Oct 2017.
- *M. D. Barrera Machuca*, W. Stuerzlinger. 2016. **3D Camera Pose History Visualization**. ACM SUI 2016, 183-183, poster, Oct. 2016.

GRANTS

- Future Leaders in Canadian Brain Research Grant 2023-2025 (co-applicant)
- CFI/JELF 2023-2025
- NSERC Discovery grant supplement 2022-2023
- NSERC Discovery grant 2022-2027
- Dalhousie VPRIIS grant 2022.
- Dalhousie Belong Research Fellowship 2021-2022
- MITACS Accelerate Grant 2020

AWARDS/SCHOLARSHIPS

- IEEE VGTC 2021 Best Dissertation Award
- SFU President PhD Scholarship 2019.
- SFU Travel Award Fall'16, Spring'18, Fall'18, Spring'19, Summer'19.
- SFU Provost International Fellowship 2015.
- CONACYT Scholarship for postgraduate studies 2015.
- CONACYT Scholarship for postgraduate studies 2012.

TALKS

- Guest Speaker at Sacred Heart School of Halifax as part of the technology program in May 22.
- Guest Speaker at Cardiff University as part of the CM3203 lecture in March 22.

STUDENTS

<i>Degree</i>	<i>Undergrad</i>	<i>MSc</i>	<i>PhD</i>	<i>PhD Examining Committee</i>	<i>Total</i>	<i>Degree</i>
<i>In Progress</i>	1	2	5	3	11	<i>In Progress</i>
<i>Graduated</i>	2	1	0	0	3	<i>Graduated</i>
<i>Total</i>	3	2	3	3	14	<i>Total</i>

Supervision

- **Undergrad Students**
 - o **Co-supervision**
 - Christian Schaarschmidt (co-supervision with Hesham Elsayed from TU Darmstadt), January 20 - December 20
 - Philipp Hoffmann (co-supervision with Hesham Elsayed from TU Darmstadt, and Rina Wehbe from Dalhousie University), January 22 – December 22
 - o **Interns**
 - *Rumeysa Turkmen* (Kadir Has University & Dalhousie University), September 2022 – now
- **MSc thesis**
 - o **Supervision**
 - Helia Homami (FCS, Dalhousie University), September 23 – now
 - o **Co-Supervision**
 - Brian Sullivan (co-supervision with Francisco Ortega from CS Colorado State University), May 22 – June 23
 - *Thesis*: Collaborating with Artists to Design Additional Multimodal and Unimodal Interaction Techniques for 3D Drawing in VR
 - Hyper A'Hern (co-supervision with Rina Wehbe, FCS Dalhousie University), September 22 – now
- **PhD thesis**
 - o **Supervision**
 - Prashant Rawat (FCS, Dalhousie University), September 22 – now
 - Jialin Zhang (FCS, Dalhousie University), September 23 – now
 - o **Co-Supervision**
 - Rodriguez (FCS, Colorado State University), January 22 - now
 - Kissinger Sunday (FCS, Dalhousie University), September 22 – now
 - Poppy Riddle (IDPhD, Dalhousie University), September 22 - now
 - Sigma Jahan (FCS, Dalhousie University), June 2023 - now

TEACHING

- CSCI 1105 (intro to programming) – Summer 2022 (50 students)
- CSCI 1110 (intro to computer science) – Summer 2022 (100 students)
- CSCI 1170 (intro to web development) – Fall 2022 (320 students), Fall 2023 (100 students)
- Directed Reading Course (Virtual Reality) – Fall 2022 (2 students), Winter 2023 (2 students)

- CSCI 4262 (Virtual and Augmented Reality) – Winter 2022 (9 students): I developed this course.
- CSCI 4226/6609 (Virtual and Augmented Reality) – Fall 2023 (11 students)

Service

Journal Reviewer

- International Journal of Humanities and Cultural Studies (IJHCS)
- Computers & Graphics
- International Journal of Industrial Ergonomics
- International Journal of Human-Computer Studies
- Virtual Reality Journal (VIRE)
- IEEE TVCG Journal

Conference Reviewer / Program Committee (PC):

- *DeSForM*: '19
- *CLIHIC*: '19, '21 (PC)
- *PG*: '20
- *GI*: '20, '21 (PC)
- *ISS*: '22 (special recognition, PC), '23 (PC)
- *CHI LBW*: '20 (PC), '21 (PC), '23
- *CHI*: '20, '21, '23 (PC), '24 (PC)
- *DIS*: '22, '23
- *IEEE VR*: '20, '21, '22 (PC conference track), '24 (PC)
- *C&C*: '22
- *ISMAR*: '21, '22 (PC conference track)
- *SUI*: '19, '20 (PC), '22
- *CHI Play WIP*: '21
- *IEEE VR 3DUI*: '21
- *MobileHCI*: '21
- *VRST*: '21 (PC)
- *UIST*: '20
- *VRST Posters*: '20

Organizing Committee:

- *Virtual SIG Fostering HCI Research in, by, and for Latin America 2020*: I helped coordinate slack channels and moderate the virtual meeting about “international collaboration and alternative conference venues”. This event was part of ACM CHI'2020.
- *SUI'22 Poster track Chair*: member of the organizing committee.
- *SUI'23 Paper track Chair*: paper track chair.
- *GI'24 Technical Program Chairs*: paper track chair.

Scholarships / Grant Reviewer:

- Adjudicator of Killam Scholarships, Dalhousie University, 2022
- France-Canada Research Fund 2022
- NSERC Discovery Grant 2022-2023