Acknowledgement of Country
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ADD/CHANGE FOOTER
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01  Who am I?
Video Games Research

I use video games to understand:

- humans,
- machines, and
- the world around us

I work at the intersection of:

Games, Virtual Environments, Extended Reality

Artificial Intelligence, Machine Learning

Human-Computer Interaction
A Story

*(Australian Senate)*

PhD (UQ)  
(2005)

Industry  
(2005-10)

QUT  
(2011-3)

Indie  
(2014-7)

ANU  
(2018-?)
My Games

20 published games

- AAA / Indie
- >10 million players
- >$250M revenue
- Screen Aus/ACT
- 4 BAFTA noms
- Various awards
- Magazine covers
- Hundreds of articles
- Top/best lists
02 Games Research

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My Research

Highlights

● GameFlow
  ○ >2700 citations
  ○ >200 applications
● Emergence in Games
● Active/Passive Screen Time

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**GAMEFLOW**

**Concentration (6 criteria)**
Games should require concentration and the player should be able to concentrate on the game

**Challenge (4 criteria)**
Games should be sufficiently challenging and match the player’s skill level

**Player Skills (7 criteria)**
Games must support player skill development and mastery

**Control (6 criteria)**
Players should feel a sense of control over their actions in the game

**Clear Goals (2 criteria)**
Games should provide the player with clear goals at appropriate times

**Feedback (3 criteria)**
Players must receive appropriate feedback at appropriate times

**Immersion (5 criteria)**
Players should experience deep but effortless involvement in the game

**Social Interaction (3 criteria)**
Games should support and create opportunities for social interaction
Project Students

- AI in games (RL, GANs, DL/ML) - StarCraft II, Atari
- Player modelling and adjustment (DDA, prediction)
- AI-driven game customisation
- Procedural generation / co-creation of game content
- Game review analysis and recommendation (NLP)
- Player experience (VR, persuasion, GameFlow)
- Human-machine teaming in games and XR
- Narrative and storytelling
- Gameful and game design

Student Publications


PhD Students

ANU Games Group

7 PhD Students

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PhD Projects

- Learning Long-Horizons in Episodic Time-Limited Markov Decision Processes (Mr Matthew Aitchison, 2019-)
- Playing to Advocate Climate Change: Harnessing the Power of Video Games to Influence Attitudes Towards Climate Crisis (Ms Mahsuum Daiiani, 2020-)
- Interpretable Recommendation for Video Games by Learning Key Features from Users’ Reviews and Ratings (Ms Lei Liu, 2020-)
- Developing cross-media franchises: an approach to creating and ethically monetising cross-medium narrative projects across multiple platforms (Mr Andrew Smith, 2020-, P/T)
- Facilitating collaborative teamwork in multiplayer online battle arena games: shared cognition and team performance (Ms Yufei Cao, 2021-)
- Patient-Tailored Exergames for the Management of Parkinson’s Disease (Ms Michelle Adiwangsa, 2021-)
- Mixed Reality for Enhancing Distributed Human-Machine Teaming (DST project, commencing 2021/2)
Who here

Plays games?
Would like to make games?
Has made their own games?
Games Industry

Worldwide industry worth $159 Billion/year
Australian sales $3.4 Billion / year

Digital Australia 2020

2/3 Australians play video games
9/10 households have a games device
47% of game players are female
Average age of players is 34 years
Games Industry

Video Games are

Fun
Art
Storytelling
Culture
Social experiences
Skill development
Training, education, rehab, therapy

ANU SCHOOL OF COMPUTING   |   CCSE - GAMES & XR

15 OCT 21
Games Industry

Games Careers

- Designer
- Programmer
- Artist
- Animator
- Producer
- Quality Assurance
What is games design?
What is the role of a games designer?
What does a game designer do?
Games Design

A coherent set of rules that formalise a game’s content in such a way that it facilitates appropriate gameplay, in order to achieve the game’s fundamental goals.

Games Designer

A person who determines the rules by which a game is formulated, in order to achieve the goals for which it was created.
Roles / Jobs
Creative Director, Design Director, Lead Designer, Gameplay/Systems Designer, Cinematic/Combat/Balance/Multiplayer, Level Designer, Writer/Narrative Designer

Tasks
Writing, Story/character creation, Level design, Scripting, Features/mechanics, Systems design, Tuning/balancing, Playtesting, Interface design/mock-ups, Community management, Internal/public relations, Coordinating/managing
Games Design

Medieval II: Total War
Help system, Tutorial, Scripting, Campaign systems, Campaign story/events, Interfaces Tools, User testing, PR/Pitching

XCOM
AI design, Training system, User testing, Multiplayer systems, Metrics system, Campaign system, Base design, Interface design, Research/upgrades
Games

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Play and Games
Video Games
Motivation and Flow
Gamification
Serious Games

Photo by eleonora on Unsplash
Play - Animals

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Play comes naturally to animals of a certain level of intelligence

For example, pets are very playful

  Easy to start playing a game based on simple, understandable rules
  Catch the ball, retrieve the stick, my hand is prey, obstacle course
Play - Animals

Young animals are particularly playful
  Almost anything in their environment is an excuse to initiate gameplay
  Without anyone teaching the animal how to engage in this behaviour

Play is fundamental to development and survival
  Young animals refine skills that are necessary to hunt, fight, mate, hide and many other activities that are key to survival as an adult
Play - Games

Games provide a safe context in which these lessons can be learned through play.

Gameplay teaches skills that are important and necessary in order to survive in real life.

Animals are capable of grasping abstract concepts like games or make-believe.
Play - Games

Games involve accepting imposed boundaries and rules to your behaviour

- Need to understand that the gameplay experience is an artificial one
- Need to understand that games are an abstract construct, governed by a set of formalised rules
- Need to understand difference between rules that govern reality and those that govern the make-believe world

Also crucial to the enjoyment of film, literature, art, music
Play - Games

Good games are rewarding
   Engaging in gameplay is enjoyable, something you want to do
Playing games makes us feel good
   Chemicals are released into our blood when we play games
   Learning is necessary to the survival of the species
   Learning is a drug
Fun from games arises out of mastery and comprehension
   The act of solving puzzles makes games fun
Humans can engage in far more complex games than animals
Humans are very good at speaking the language of games
  People all over the world play games in which the rules are easy and intuitively understood
Humans have a universal gameplay grammar
  We can play games with people who speak different languages, have different cultures, and we haven’t met
  We can play games with animals from different species
Video Games

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Traditional play is about teaching skills and testing the player’s proficiency

It is rewarding to master a task or be good at something

Video games:

Teach motor skills, mental skills, skills of reasoning, and so on

Allow us to put those skills to the test in a controlled manner

A good game strikes a balance between:

Teaching these skills, and

Providing the player with an enjoyable test-bed in which to try them out
Games and Play

Games are rule-bound activities with goals and at least one player who tries to fulfil the goals

Games are a form of play with structure

“paidia” and “ludus” for playing and gaming (Caillois)

- Two poles of play activities
  - Paidia - uncontrolled, free-form, improvisational
  - Ludus - restricted, structured, goal-focused
Intrinsic Motivation and Flow

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Intrinsic Motivation: doing something is inherently interesting/enjoyable
Extrinsic Motivation: doing something leads to a separable outcome
Self-Determination Theory (SDT) explains motivation based on innate psychological needs for competence, autonomy, and relatedness
Rewards can be experienced to be more or less controlling
Flow is an experience “so gratifying that people are willing to do it for its own sake, with little concern for what they will get out of it, even when it is difficult or dangerous”
Games and Gamification

Games are an autotelic experience with motivational pull
Gamification is the design strategy of using game design elements in non-game contexts
Selection and usage of the game design elements is key
Play is central to games. Rules and goals alone do not make a game
Reward-based gamification: points, levels, leaderboards, achievements
Meaningful gamification: using game design elements to help build intrinsic motivation and meaning in non-game settings
Serious Games

Games with a purpose (beyond entertainment)
A game rather than a gamified application
Many games for education and training
Others - health, exercise, science, persuasion
Examples - Microsoft Flight Simulator, Duolingo, Minecraft, World Without Oil, FoldIt, IBM City One
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Virtual Reality
VR Games
Augmented Reality
Haptics
Brain-Computer Interface
Virtual Reality

1970s - “the illusion of participation in a synthetic environment rather than external observation of such an environment” (Gigante 1993)
Goal to create experiences that “feel real”
Images are displayed stereoscopically - VR headsets
   Audio and haptics also important
Virtual Reality

Presence - “being there” (Slater and Wilbur, 1997)
Fidelity - true / exact
Different perspectives
  1st/3rd person, world
Head-mounted displays, Cybersickness
Assumptions: Higher fidelity is better for learning/training
Virtual Reality

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Research and Design Considerations

- Learning/training, health applications
- Remote operations, travel, tourism
- Presence, comfort, veracity, verisimilitude
- Navigation, interactions, movement
- Collaboration, communication
- Tools - Unity, Unreal
VR Games

Superhot and Superhot VR

Skyrim and Skyrim VR

**Aim:** Understand affordances and inhibitors of enjoyment in VR video games

**Approach:** apply the GameFlow model to review and analyse VR and non-VR versions of the same games to identify differences in enjoyment in VR games

VR Games

VR affords more control and easier interaction with a more direct connection between physical and virtual movements and actions

- But disconnect between actions and expected feedback can be jarring (e.g., archery in Skyrim VR, throwing in Superhot VR)
- Players need higher veracity feedback in VR games to meet expectations and to feel effective in their actions

VR games can afford increased emotional and visceral immersion

- Physically performing actions and being present in the world

Increased immersion can come at the cost of a loss of sense of control

- Limited in ability to freely move around both VR games
- Perceived inaccuracies, limited input mechanisms

VR games, even complete and extensive games like Skyrim VR, can feel “more like a tech demo than a full experience”
VR Games

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Comfort

We defined Comfort as how comfortable a player feels while playing a VR game, with respect to physical issues such as play space, body position and movement, and cyber sickness.

Comfort was identified to be a key enabler or inhibitor of player enjoyment in VR games.

- Cybersickness, standing/sitting, play space size/use, player control

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<td>Games should afford different players to control their level of comfort.</td>
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<td>Games should afford players to feel comfortable in their play space.</td>
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<tr>
<td>Games should afford players to feel comfortable with their body position throughout play.</td>
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<tr>
<td>Games should afford players to feel comfortable with their movements.</td>
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<tr>
<td>Games should afford players to minimise feelings of nausea.</td>
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Augmented Reality

- Pokémon Go - mobile-based AR
- AR application history and areas
- Head-up displays (HUDs)
- AR headsets and glasses
- Research and Design Considerations
Haptic Interfaces

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Tactile feedback - vibration and force
Vibrotactile feedback
Ultrahaptics - https://www.ultraleap.com/
Exoskeletons

Sharp et al. Figure 7.21
Sharp et al. Figure 7.22
Brain-Computer Interfaces

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Communication pathway between brain and device
Detects changes in neural functioning
BCI research and applications
BCI and games

Source: Emotiv
Questions?

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ANU School of Computing
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