

*USC Games*

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# Building a Games R&D Program

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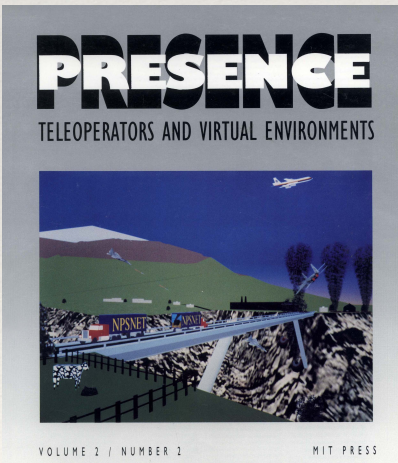
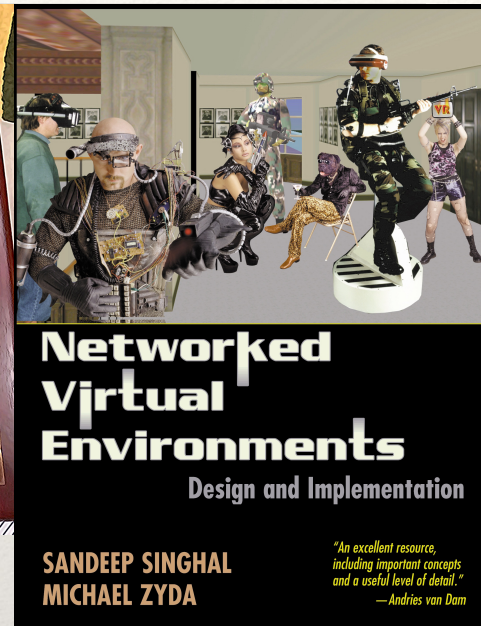
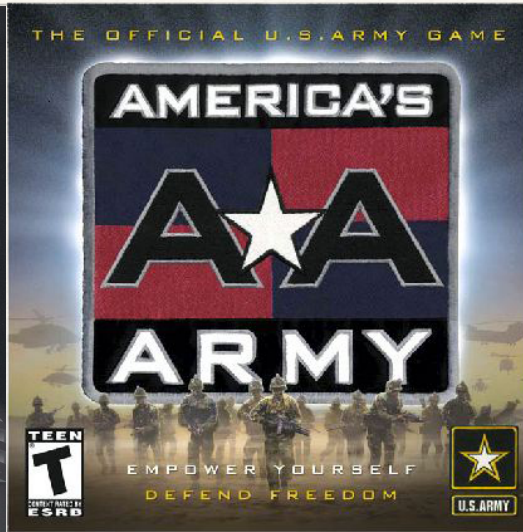
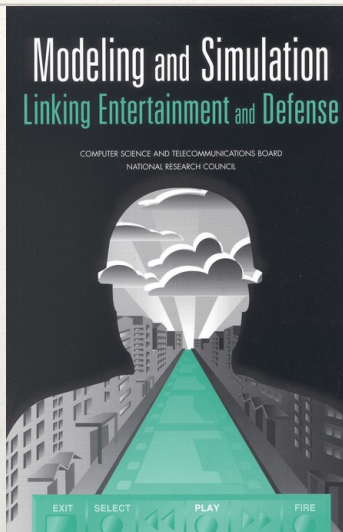
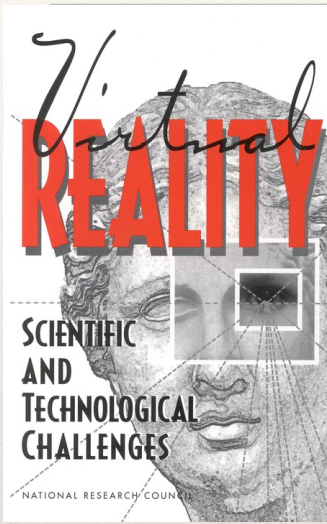
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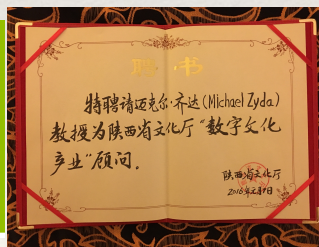
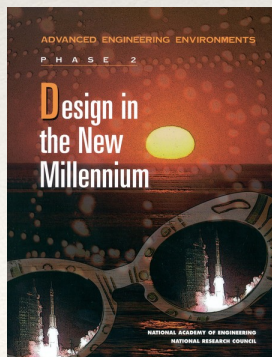
# Michael Zyda Bio

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# Michael Zyda Bio



## USC Games



# USC Games

# #1

**Game Design Program  
in the Country**

via The Princeton Review

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# Degrees

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We have graduated some 2,700+ students over the last 14 1/2 years.

Our alumni have shipped games played by over 2.5B players. This is about \$100B in revenue over 10 years.

The USC Games Program is THE academic program that has had the largest impact on the Game Industry.

Our alumni have gone to over 600 different companies & overwhelmingly staff the largest companies that make \$1B+ games.

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# Advanced VR Games

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# Embedded

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# Paws 'N Claws

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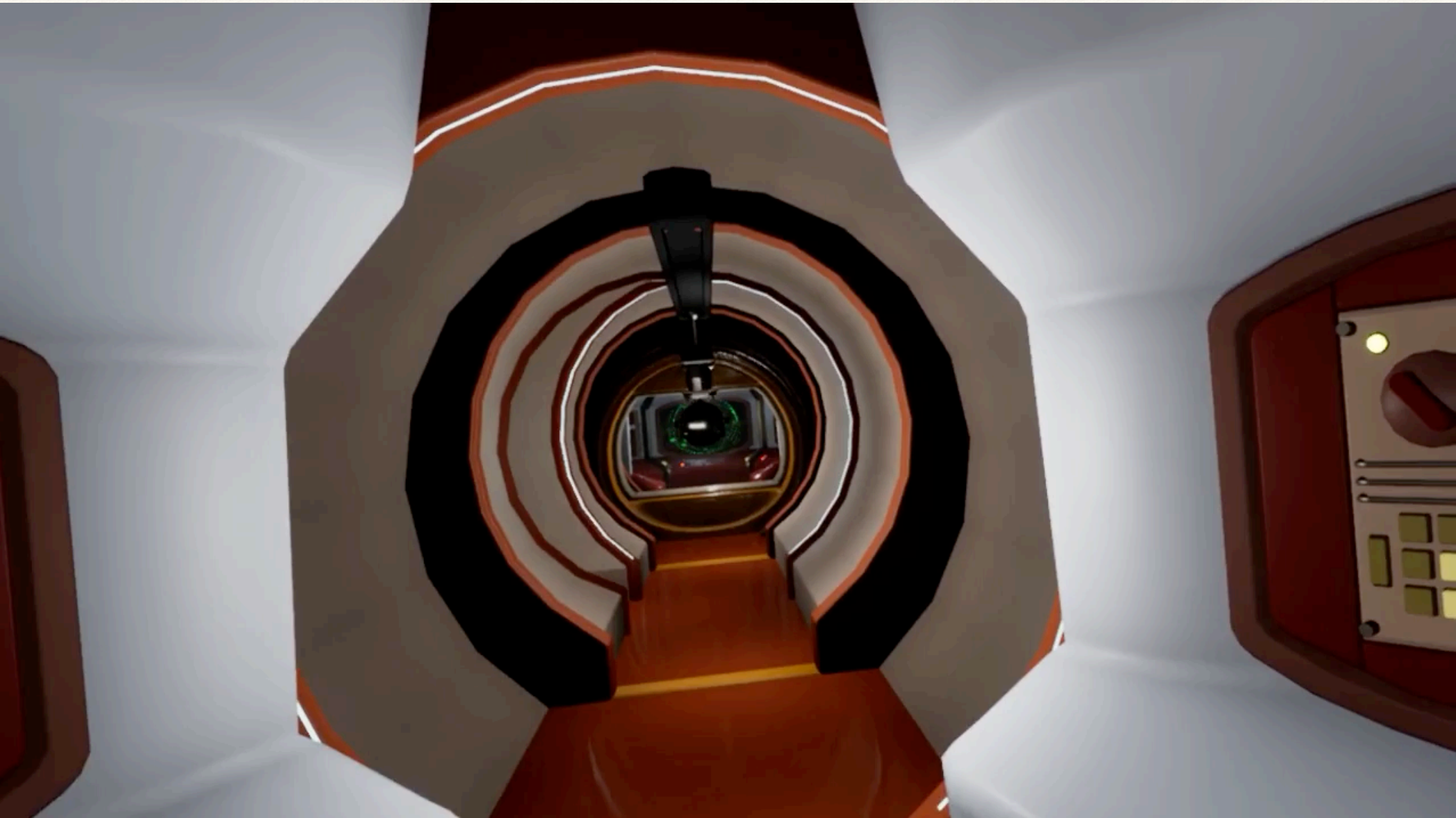


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# Super Nova

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# Pytheas



CSCI-538

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# AR, VR & Mixed Reality

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# CSCI-538 AR, VR & Mixed Reality

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- ❖ We have a semester long class that focuses on having the students create an AR/VR/Mixed Reality of their own choosing.
- ❖ We have HTC Vives, Google Daydream devices & Pixel 3 XL phones, Magic Leap devices, ...
  - ❖ Spring 2018 - only 20 students
  - ❖ Fall 2018 - 65 students
  - ❖ Spring 2019 - 88 students

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# CSCI-538 Spring 2018

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- ❖ Cooking with Glarb
- ❖ Creature Clash

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# Cooking with Glarb

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# Creature Clash

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# CSCI-538 Fall 2018

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- ❖ Battle Surface
- ❖ Galaxiator VR
- ❖ GEARS
- ❖ HoloASL
- ❖ RuGo
- ❖ Secret of the Pharaohs Power
- ❖ Smart Recruiter
- ❖ Social Lens
- ❖ US Space Force Flying Simulator
- ❖ Vengeance
- ❖ WordPlay VR



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# Battle Surface

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# Galaxiator VR

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# Gears

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# HoloASL

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RuGo

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# Secret of the Pharaohs Power

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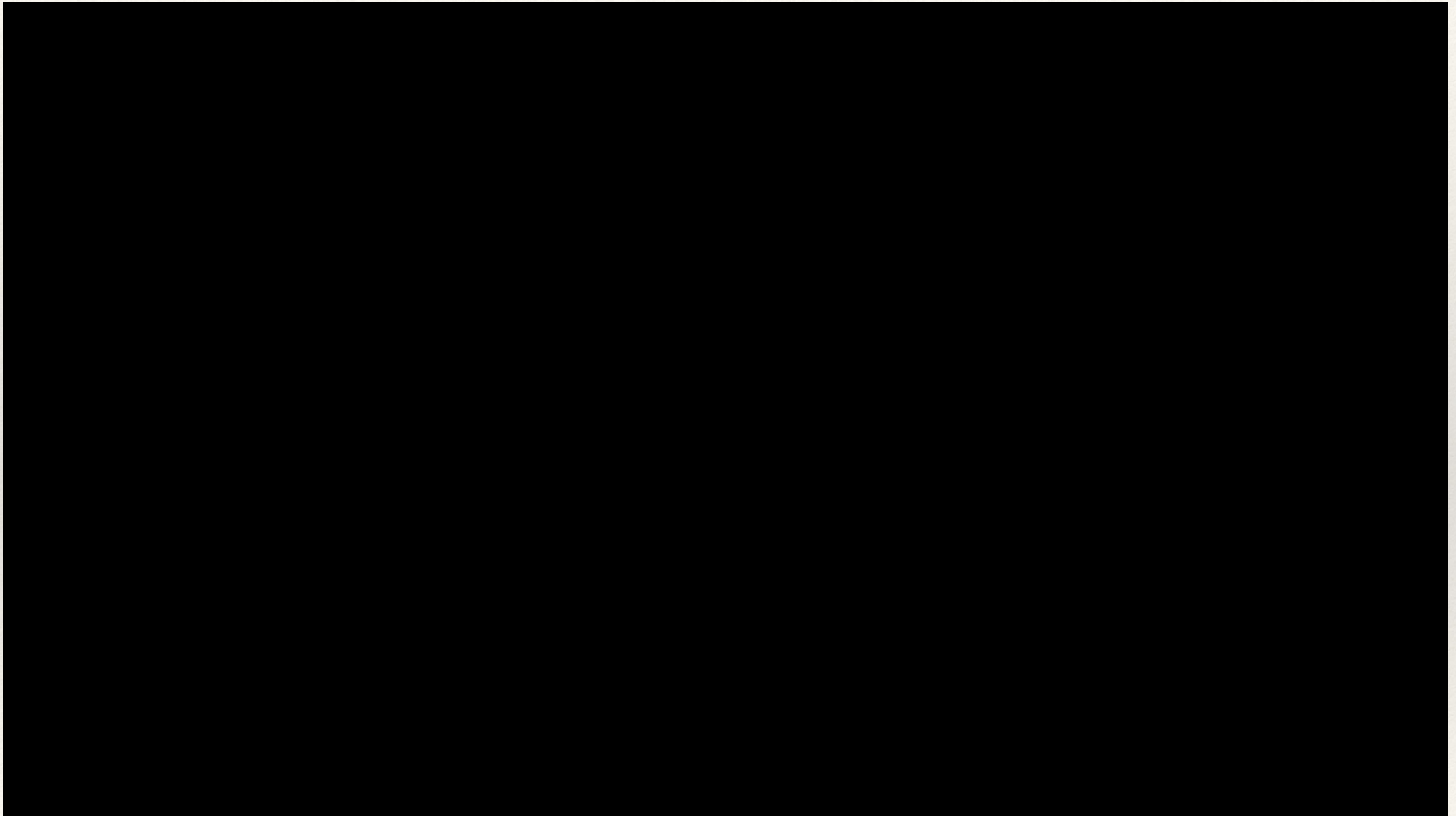
# Smart Recruiter

Ever Been To A  
CAREER FAIR ?

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# Social Lens

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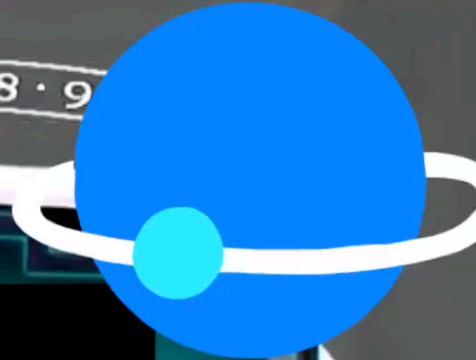




# US Space Force Flying Sim

Welcome to

0·1·2·3·4·5·6·7·8·9  
Speed



Shields  
0·1·2·3·4·5·6·7·

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# Vengeance

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# WordPlay VR

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So building stuff lets people prototype their dreams ...

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And building stuff leads to ideas for R&D to build the next stuff ...

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# Some R&D Directions

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# Research Directions

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- ❖ Virtual & Augmented Reality
  - ❖ Technology Development
  - ❖ Experience Authoring
- ❖ Machine Learning, Deep Learning & Natural Language Processing
- ❖ AI Characters with Embedded Emotion Models
- ❖ HMD-less VR/AR

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# Virtual & Augmented Reality

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# VR/AR - A Quick History



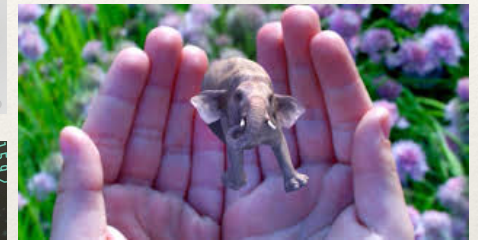
1968



1994



2016



2016 - 2019



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# Things We Really Need to Have to Make VR Interesting

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- ❖ Smaller, Lighter HMDs
- ❖ Lightweight, non-intrusive tracking
- ❖ Locomotion Solutions
- ❖ Speech Recognition
- ❖ AI Characters with Emotional Models
- ❖ High Speed Mobile Networks
- ❖ Lighter, Smaller, Cheaper VR Cameras
- ❖ Augmented Reality

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# AI Characters with Emotion Models

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# AI Characters with Emotional State

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- ❖ Recent focus has been on using NLP to read newsfeeds & IBM's Watson to generate an emotional state vector for an AI Character.
- ❖ Define a personality for the AI character.
- ❖ Build a simple model of emotions for the AI character that can be driven by the IBM Watson results.
- ❖ Show changes in game play behavior for the AI characters based on the changes in the preferred newsfeeds ...

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# Emotion Analysis

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- ❖ Emotion Analysis, also known as opinion mining or emotion AI, is a way to classify, analyze, and extract emotional tone / attitude of the speaker through his / her speech, of writer through the written text with respect to a given context.
- ❖ It uses Natural Language Processing, computational linguistics and text analysis to achieve the results in source materials.

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# Process Flow

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- ❖ Initial Work – Decide the websites to scrape the data
- ❖ Data Analysis and collection
- ❖ Scrape the data
- ❖ Refine the scraped data
- ❖ Run IBM Watson to analyze tone of the text.
- ❖ Build a game that uses the tone information to change the behavior of AI characters.

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# Current Project Status

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- ❖ We were able to get the emotion information to Unity but we now need a designer & devTeam to build the game that utilizes this.
- ❖ Will need to develop a simple emotional model embedded in the AI character in the game & will need to define the personalities of the AI characters whose behaviors are changed from the newsfeeds ...

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# Other Directions

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- ❖ Facebook analysis - read the next 50 posts of my FB feed & give me an emoticon of emotional tone ...
- ❖ Messaging analysis - BEFORE you send out that hostile text message, get a caution on the emotional tone of your message & perhaps a rewrite ...
- ❖ Screenplay analysis - determine emotional & social continuity of new screenplays. Highlight script problems utilizing database of Academy of Motion Picture Arts & Sciences screenplay database of Academy Award Winners.

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# LOL Bots

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## League of Legends

### Using Deep Learning to Understand Game Play & Create Game Playing Bots

#### **Collect Data from Master Players**

- Screen capture
- Video screens & hands of Master Players
- Collect this for large numbers of Master Players.

#### **Use Collected Video Data & Deep Learning to**

- Determine player Actions in What Part of the game.
- Create Action/What Tuples for input into a neural network.

#### **Master Player Model**

- Build a neural network with the Action/What Tuples.
- The neural network models what Master Players do in each part of the game.

#### **Created by**

Michael Zyda, zyda@usc.edu

4 January 2019

## League of Legends

### Using Deep Learning to Understand Game Play & Create Game Playing Bots

#### **Create Game Model**

- Create a Game Model using the Master Player Model (Actions/What/NN) & some guidance from the Spec, the provided technical paper on the game.
- The target is to make the Game Model a learned model of the complete game via Deep Learning but we may need to reduce the search space initially via using the Spec. & we need to understand from the Spec the goal of the game.

#### **Create Game Bot Perception Model**

- Create the real-time Perception Model (where the Game Bot perceives the other players are, the Game's State.) via screen capture & reference to the Master Player Model & the Game Model.

#### **Create Game Bots**

- Create Game Bots that can perform like a Master Player using the Master Player Model to generate Actions based on its Game Model (learned model of the complete game) & its Perception Model (where it perceives the other players are, the Game's State.).

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# Tools Used

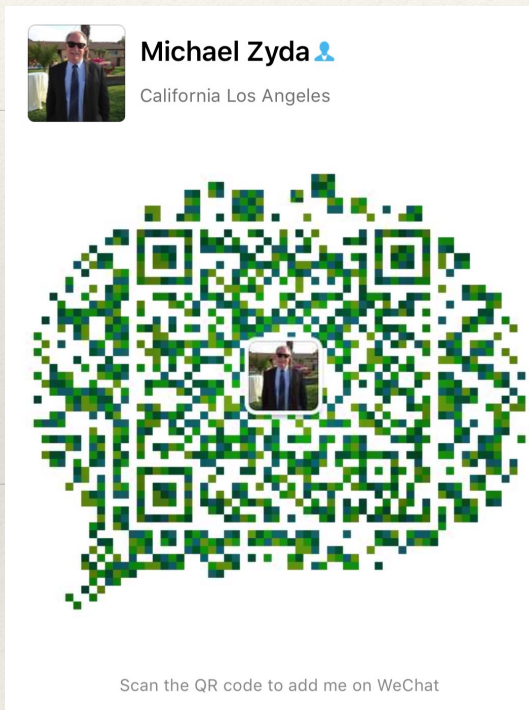
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- ❖ Yolo3
  - ❖ Object detection system for analyzing frames pulled from Youtube videos of Master Game Play ...
- ❖ Tensorflow & Keras
  - ❖ Keras - to train the neural networks, built on top of Tensorflow
- ❖ OpenAI Five for bot creation




*Preguntas?*

Questions?



Michael Zyda   
California Los Angeles



Scan the QR code to add me on WeChat

The image shows a WeChat profile card for Michael Zyda. At the top left is a small profile picture of a man in a suit. To the right of the picture is the name 'Michael Zyda' followed by a blue verified account icon, and below that is the location 'California Los Angeles'. The main part of the card is a large QR code that has been stylized to look like a brain, with the QR code's black and white pixels forming the brain's structure. In the center of the QR code is a small circular inset of the same profile picture. At the bottom of the card, there is a small line of text: 'Scan the QR code to add me on WeChat'.

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