

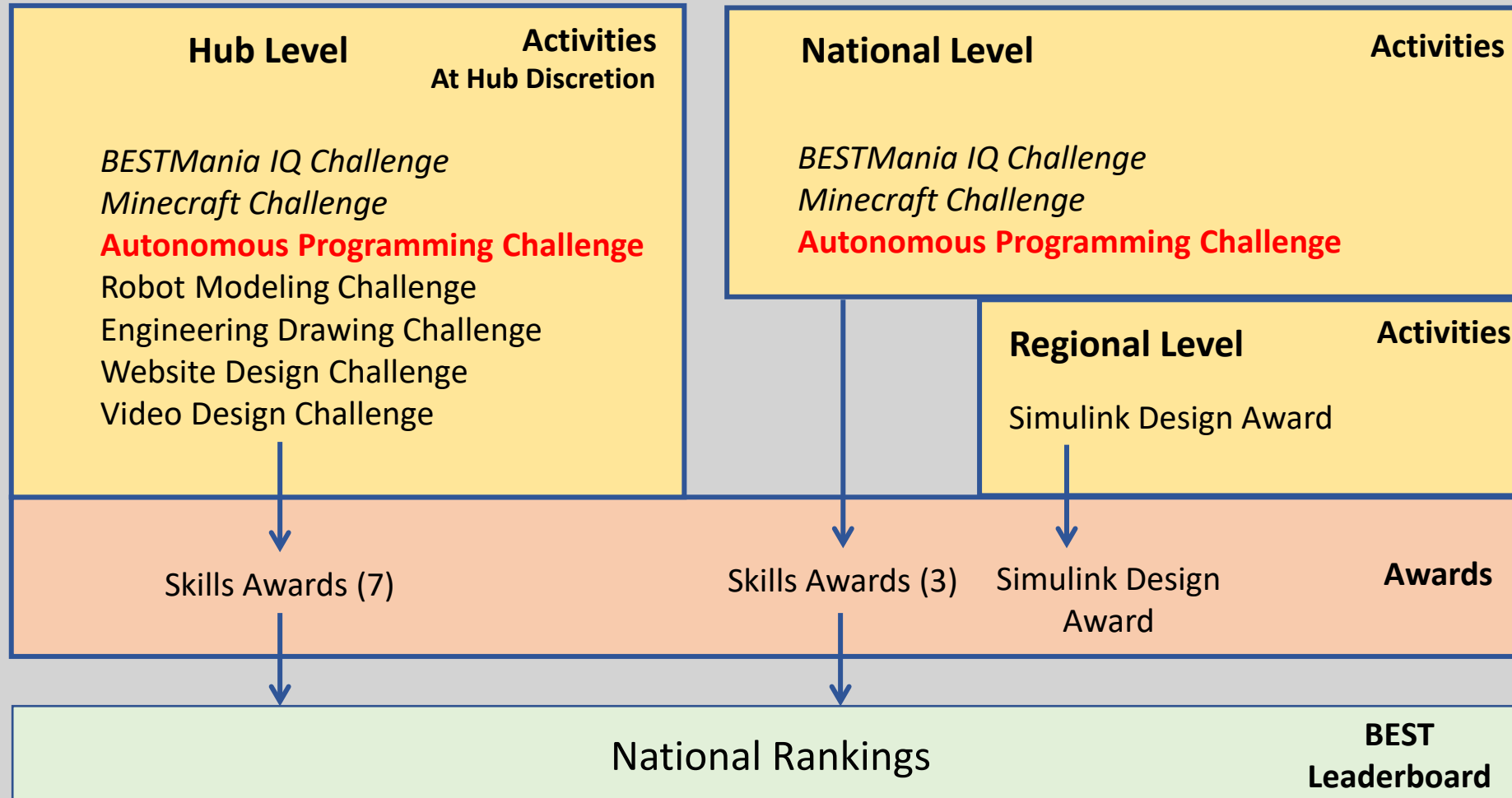
# 2021 BEST Competition

Autonomous Programming  
Challenge

Aug 16, 2021



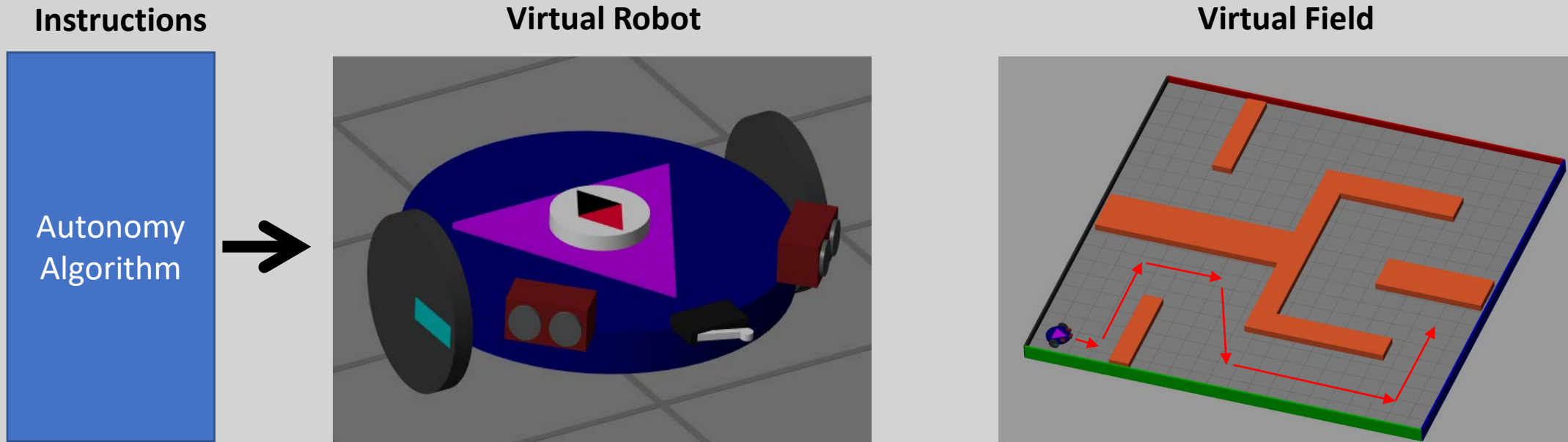
# BEST Skills Challenges



# Autonomous Programming Skills Challenge

What is it?

- Create Autonomous programs to solve the game objectives
  - Responding, reacting and running independently, with no direct human control



# Autonomous Programming Skills Challenge

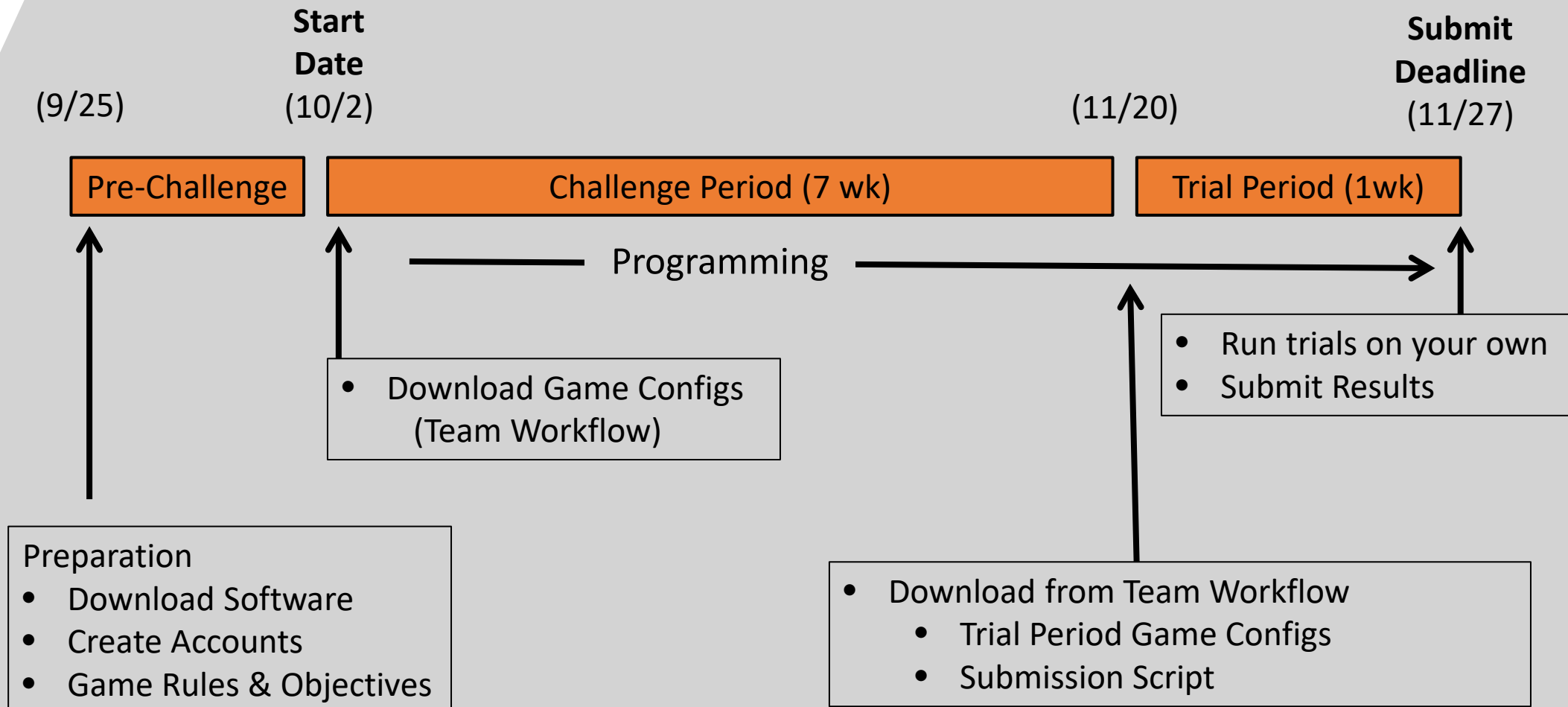
What is it?



- Uses Mathworks Robotics Playground
  - 3D Virtual Field and Virtual Robot provided
  - ***Same Challenge*** used in 2021 BEST Online Competition Robot Performance Time Trials
  - ***Now Available to Any Teams*** regardless of the Competition Format
- Multiple Phases
  - Unique Objectives
  - Unique Time Constraints
- Multiple Levels of Ranking & Awards
  - Hub Level
  - National Level
- Complete rules and instructions provided one week before the Start date

# Autonomous Programming Challenge

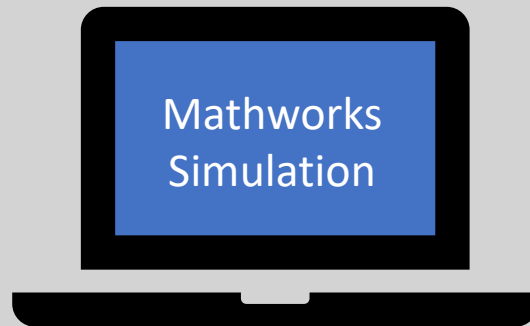
## Challenge Protocol



# Autonomous Programming Options

Local or Cloud Environments

## OPTION 1



Student

Single Windows Computer  
✓ meeting system requirements

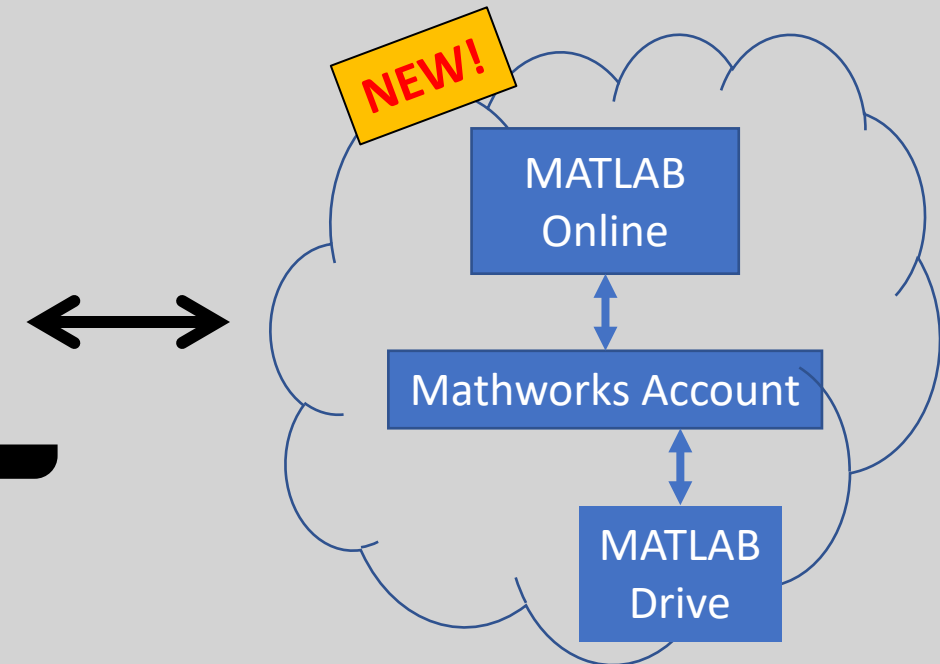
OR

## OPTION 2



Student


Any Computer  
✓ With Internet Access



***3D Simulation is done in the cloud!  
Access & run from any computer!***

# User Guides

Rules, Installation and Trial Guides available through your Team Workflow

BEST National Registry  
Teams  
Team Workflow 

Annual Game Files & QnA

After Hub Kickoff

Click on a folder in the left tree to expand and view files located in that folder. Expanded folders are indicated with a downward carrot. Files on the right can be viewed or downloaded. You should not share these files with individual outside of your team.

Open Files

→ QnA

Public Resources & Training

2020 Game Files

Game Logo

Kit

Rules

Field

Guides

FILE

SIZE

UPLOAD  
DATE



2020\_Outbreak\_Online\_Autonomous\_Programming\_Challenge\_Guide.pdf

1,384.8 MB

20200829



Mathworks\_Platforms\_and\_Installation.pdf

714.8 MB

20200914



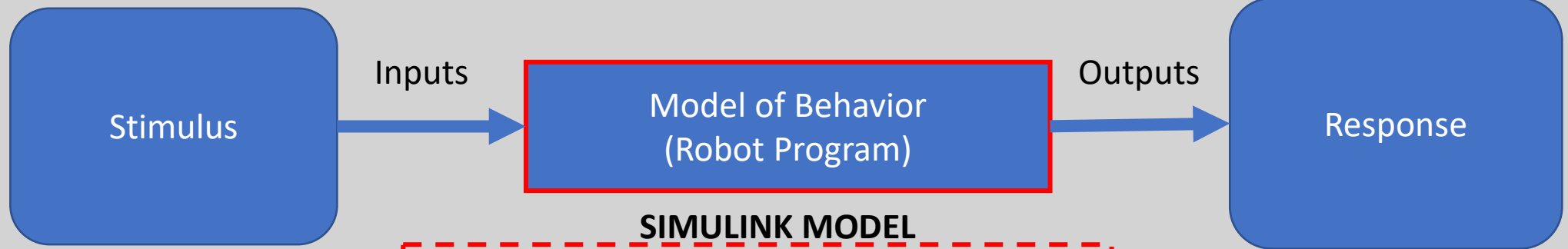
2020\_Outbreak\_Online\_Robot\_Performance\_Time\_Trials\_Guide.pdf

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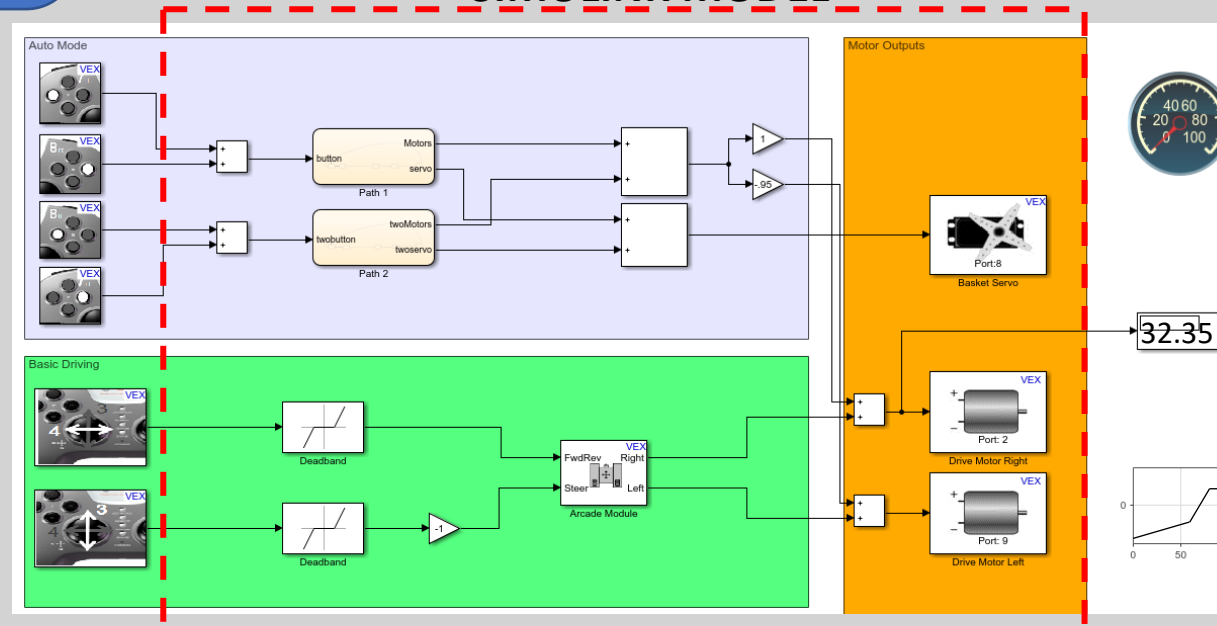
# What is Simulation?

## Modeling Robot Behavior



### SIMULINK MODEL

Constant,  
Toggle,  
Slider,  
Algorithm

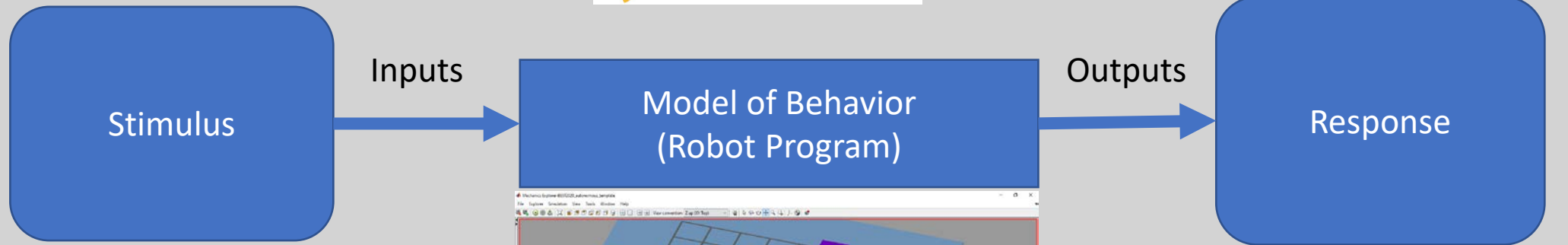


Displays,  
Gauges,  
Graphs,  
Plots,  
etc.



# What is Simulation?

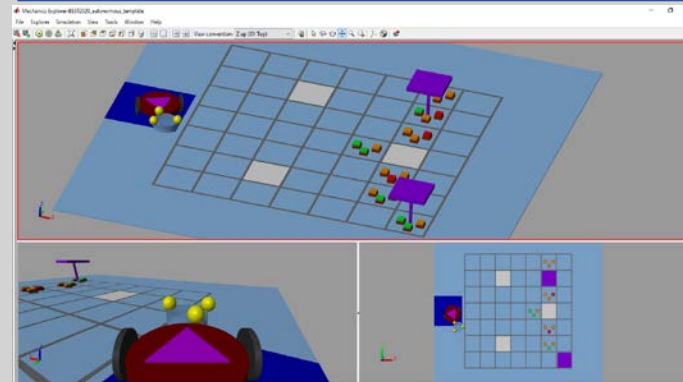
## Modeling the Environment



**SIMULINK**

Constant, Toggle, Slider, etc.  
Algorithm

Displays, Gauges, Plots, etc.



3D Graphical View  
of Solid Model

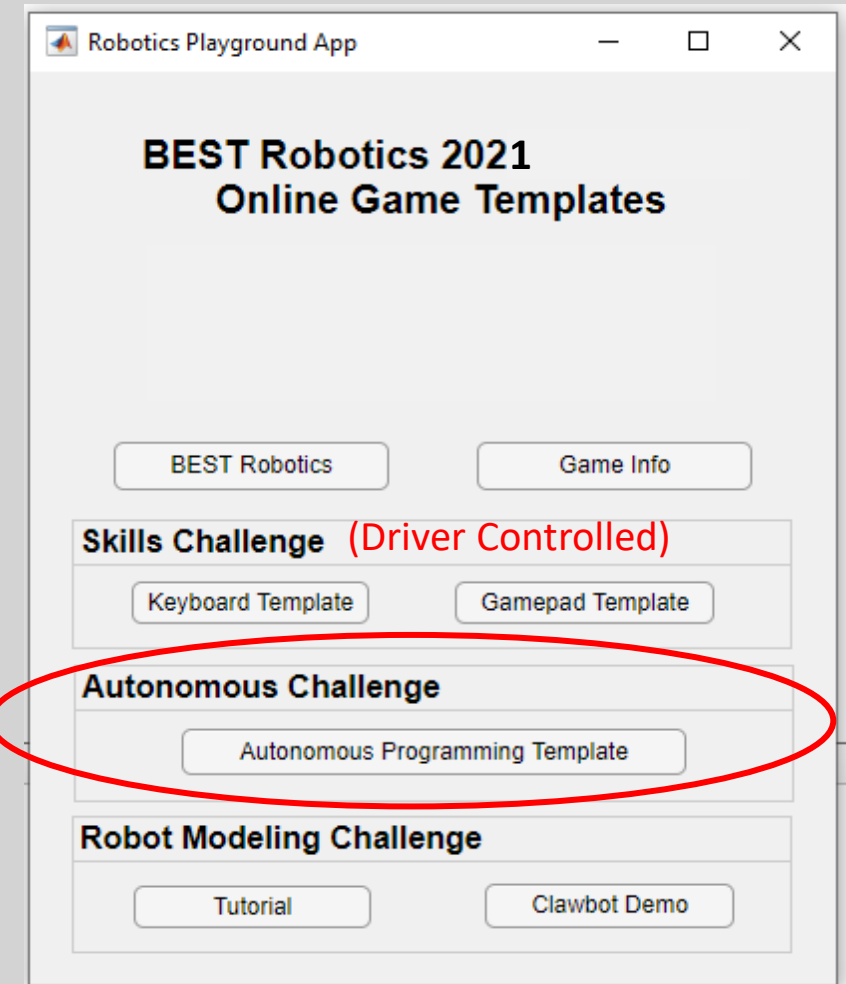
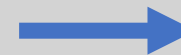
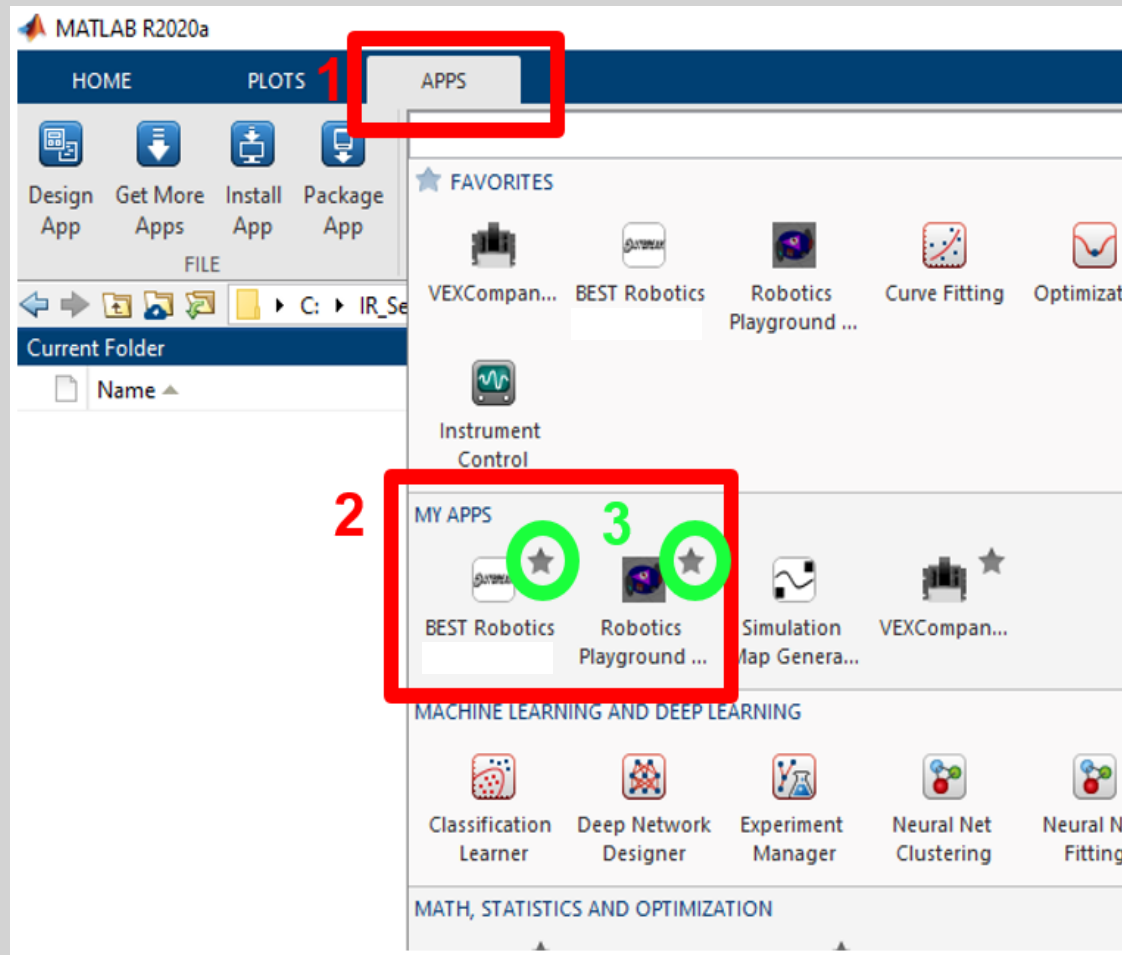
Model of Behavior  
**Environment**  
(i.e., Game Field)

**ROBOTICS  
PLAYGROUND**

Joystick/ Keyboard,  
Algorithm

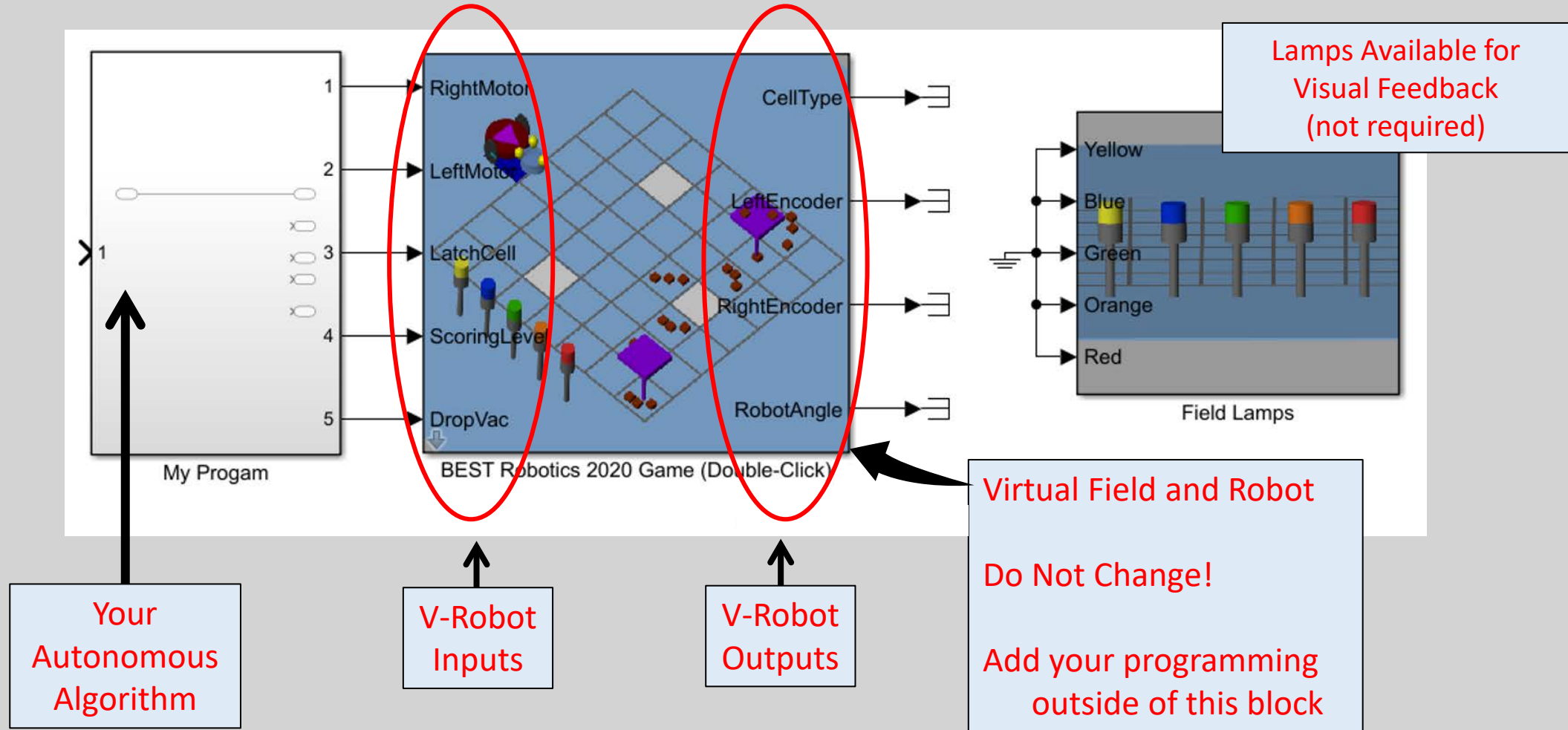
# Getting Started

(BEST Robotics App and Simulink Model Templates)



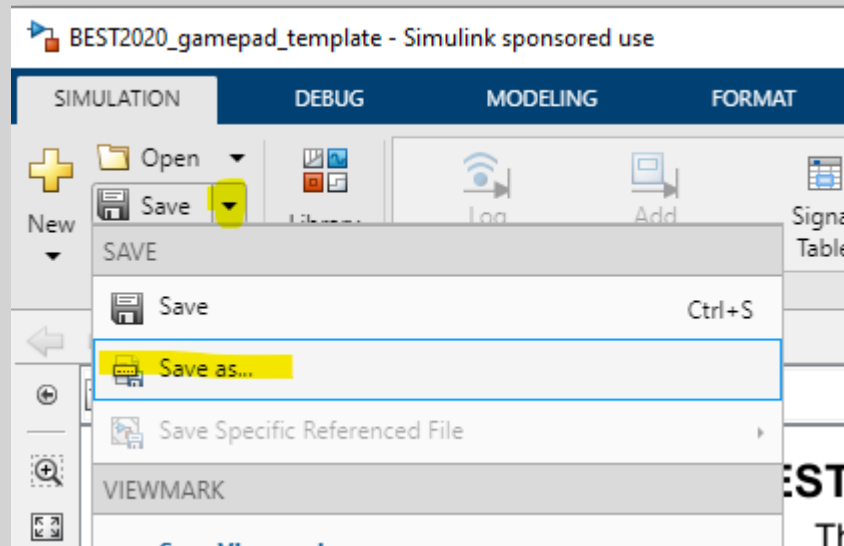
# Simulink Model Autonomous Template

## Programming The Virtual Robot

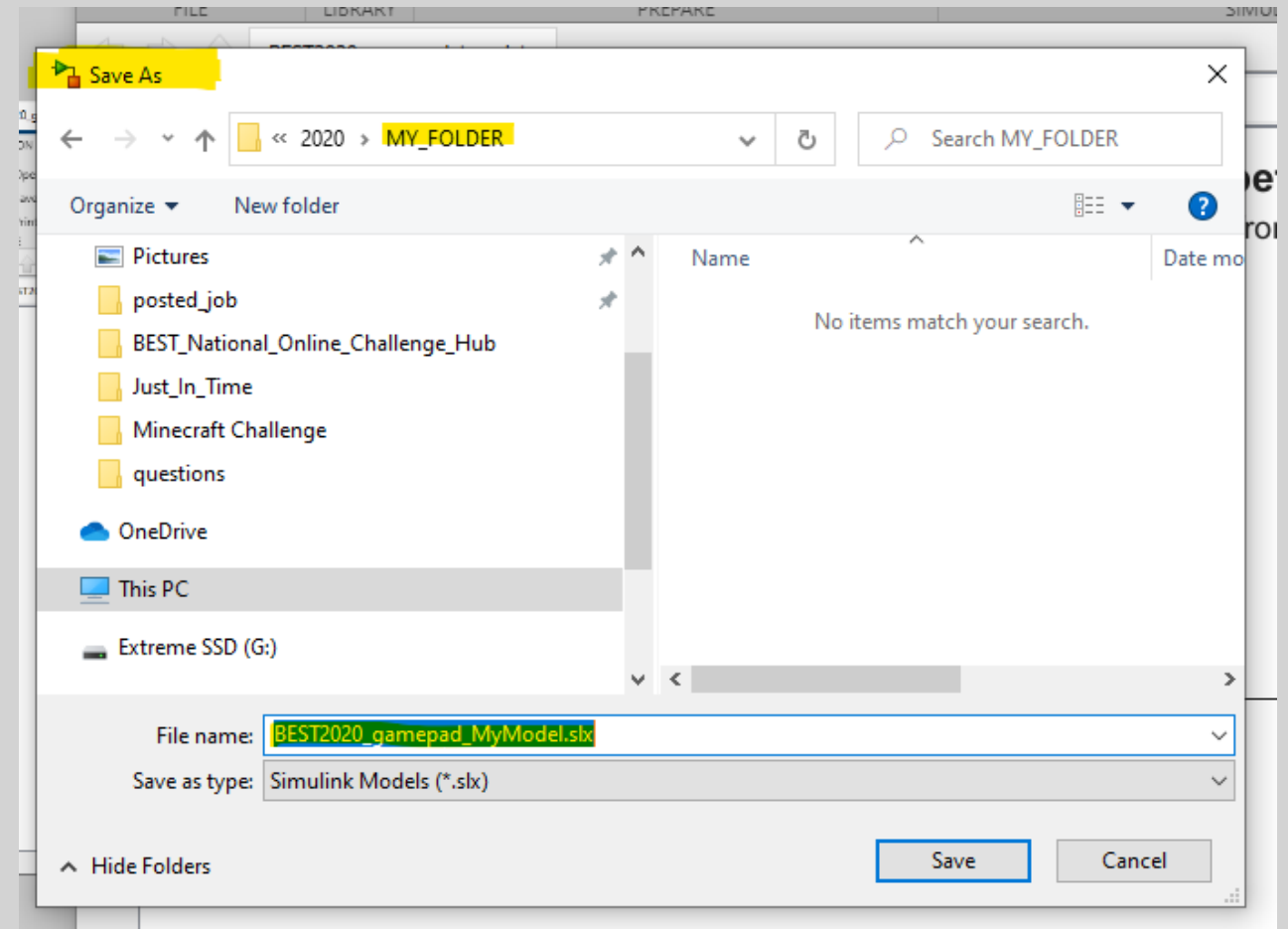


# Saving YOUR Simulink Model

## Programming










- Save your Simulink model in a NEW folder
- Do Not Overwrite the Template File!

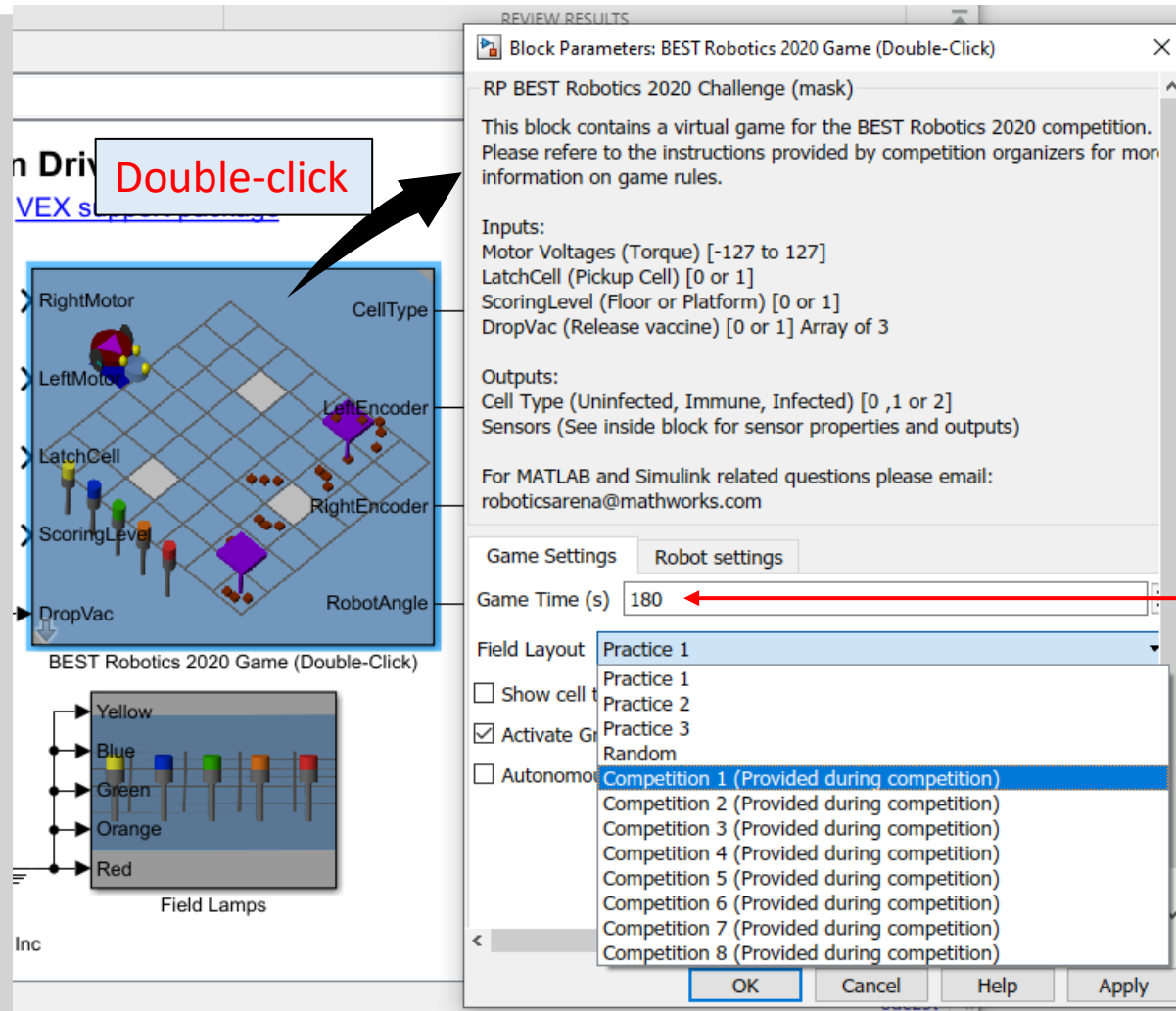


# Game Configurations

- Multiple Phases/Game Configs
- Each Phase has a Unique Objective
  - Collect Certain Items
  - Complete Specific Tasks
  - Specific Time Allowed (e.g., 30 sec, 1 minute, etc.)
- Initial Game Configs available at Kickoff
- Provided via the **Team Workflow**
- ***Final Game Configs Available at beginning of Week 8 (Nov 25)***

Annual Game Files & QnA				
	NAME	DESCRIPTION	DATE UPLOADED	PERMISSION
	Kickoff	Autonomous Challenge Field Config #3	9/30/2020 3:36pm	public
	Kickoff	Autonomous Challenge Field Config #2	9/30/2020 3:36pm	public
	Kickoff	Autonomous Challenge Field Config #1	9/30/2020 3:35pm	public
	Teams	Robot Performance Time Trials Scoring Script	9/30/2020 4:16pm	confidential
	Teams	Robot Performance Field Config #3	9/30/2020 3:41pm	confidential
	Teams	Robot Performance Field Config #2	9/30/2020 3:39pm	confidential
	Teams	Robot Performance Field Config #1	9/30/2020 3:39pm	confidential

# Selecting the Game Field Configuration

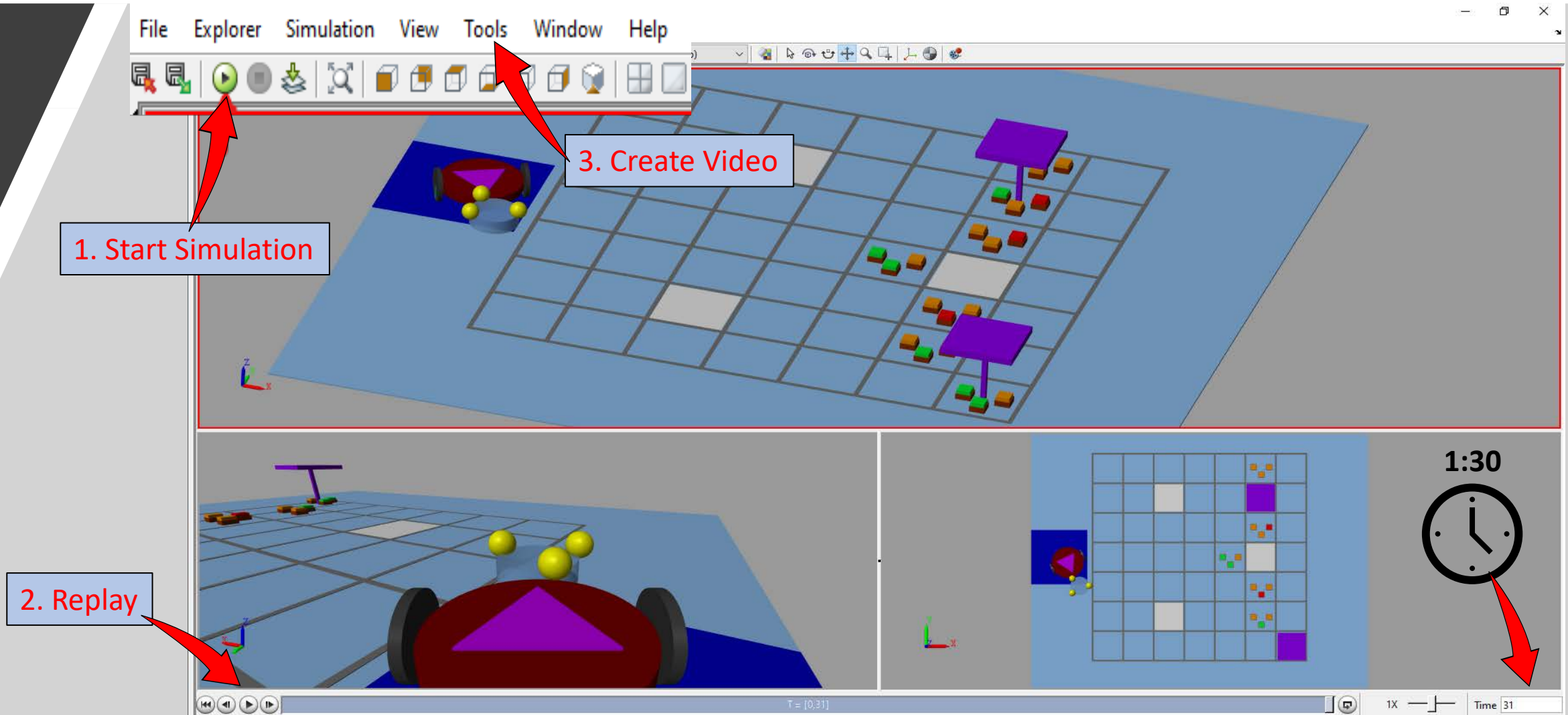


- Game Field Configuration Setup
- Game Field Configuration Files
- Select the Field Layout
  - Matching the Phase/Trial # (1-8)
- Set the Allowed Game Time (seconds)



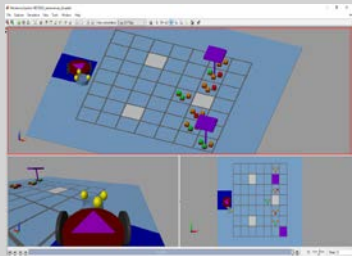
# Running each Phase Time Trial

Running Simulation, Creating Video



# Submitting Final Results

## Simscape Mechanics Explorer



DO NOT Reset or Restart  
(will lose the results)

Create/Save Video  
of the Time Trial

Switch to  
MATLAB  
Window

## MATLAB Command Window

Add  
Screenshot  
Here

Execute the  
UPLOADRESULTS script

Complete the  
Form Accurately

Check for the  
Upload Confirmation

**Accuracy is  
YOUR responsibility!**  
Team #  
Game Config #  
SLX Model  
Video



# Autonomous Programming Challenge

## Summary

- 8-week programming challenge
- Autonomous Programming Only
- Local Software or MATLAB Online
- Final Game Configs available in final week (7 days for best run)
- Multiple Game Configs & Objectives to run (3-4)
- Submission deadline (results + video + slx model)
- Hub-level ranking and awards
- National-level ranking and awards

# Autonomous Programming Challenge

## RULES RELEASE

Complete Rules for each Phase/Time-Trial will be released on  
September 25, 2021

(1 week prior to the Challenge start date October 2, 2021)

End