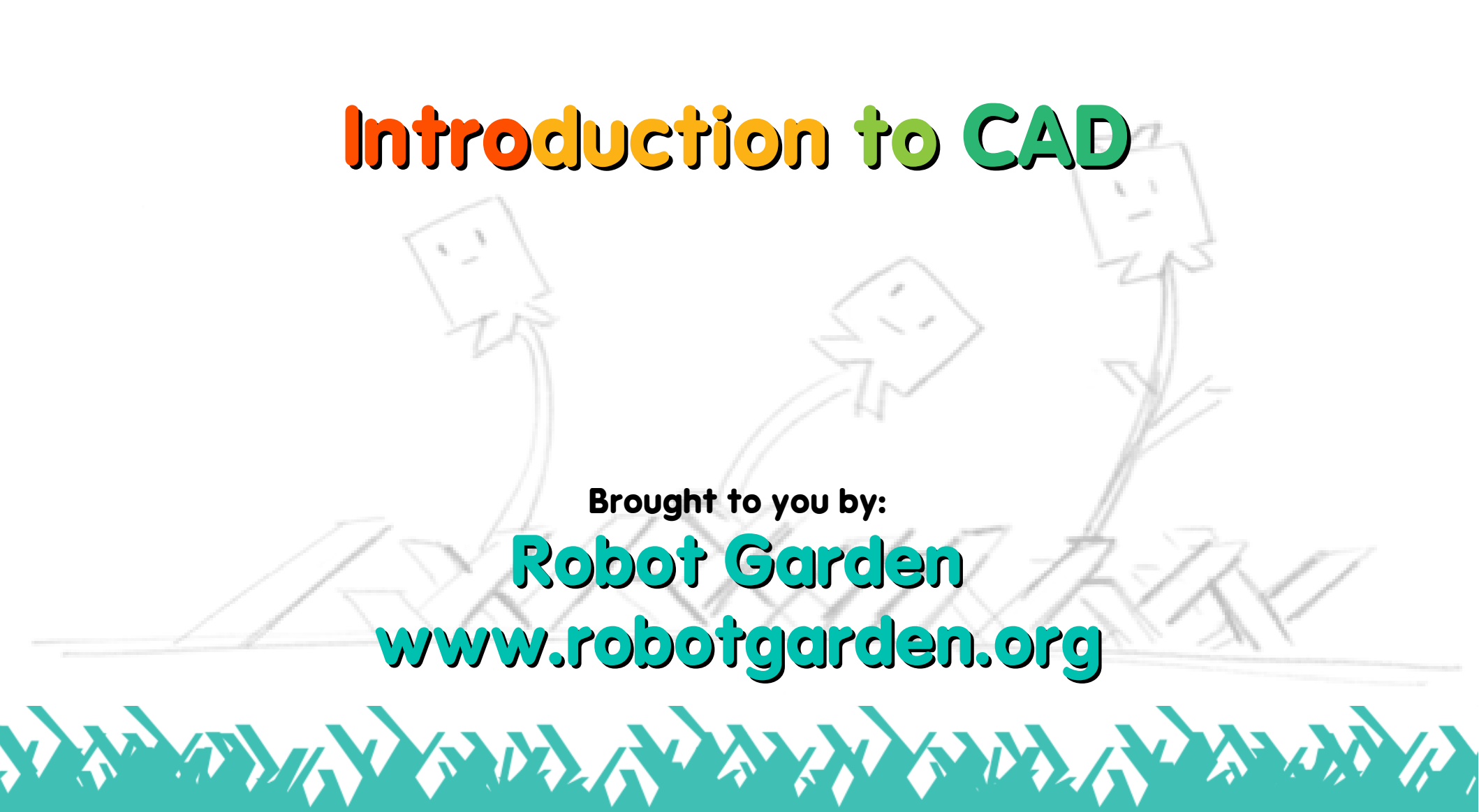
Introduction to CAD



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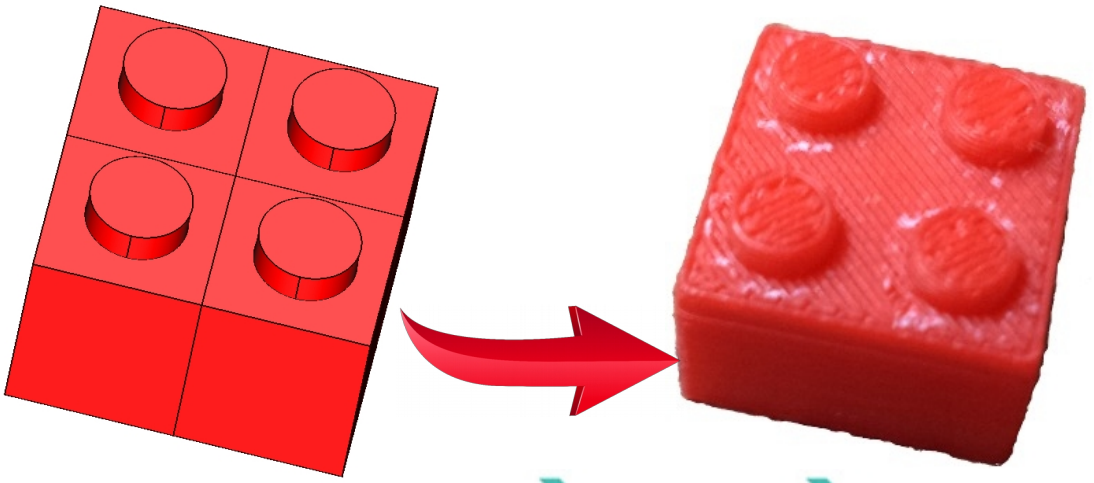
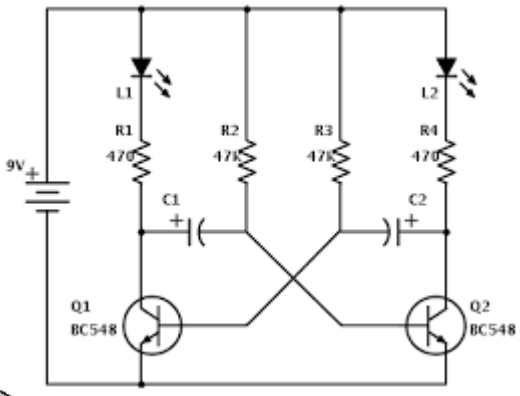
What is CAD?

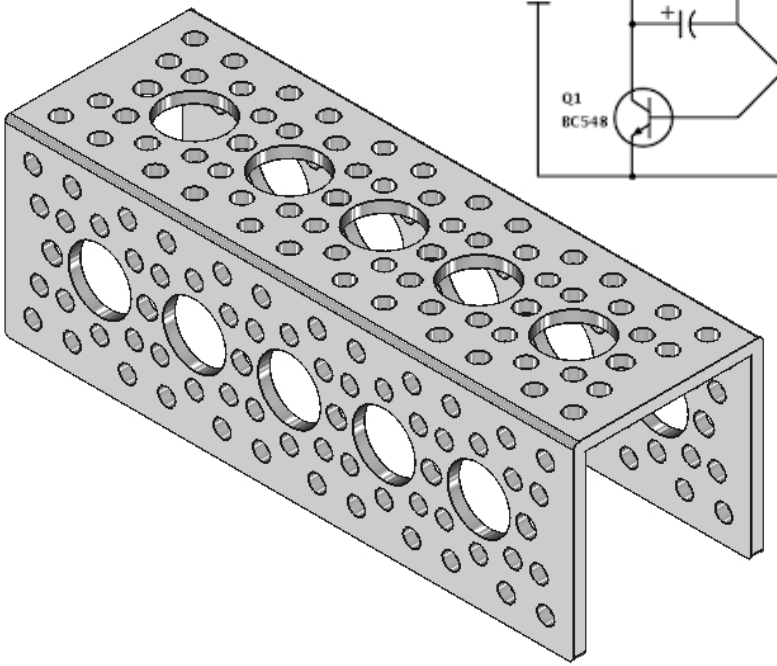
- Computer Aided Design
- Pipeline to Computer Aided Manufacturing
- 2D, 2.5D and 3D
- But what can I do with it?

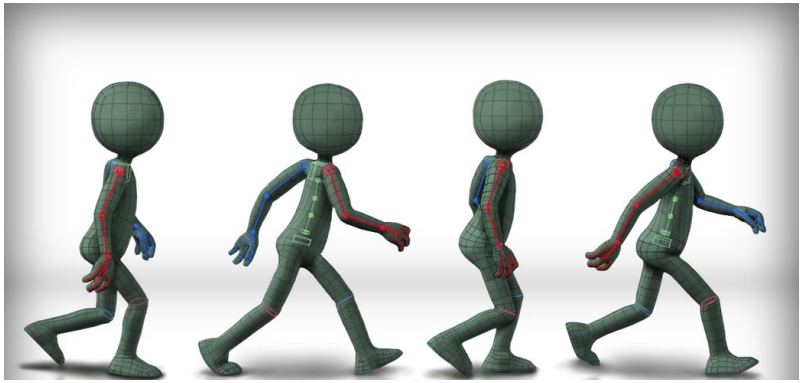


CAD Applications

- Part Design
- Landscaping Design
- Building Architecture
- Mechanical Design
- Electronics Design
- Animation
- Can you think of others?

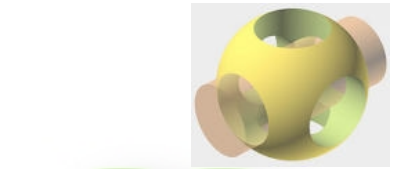






Common CAD Software

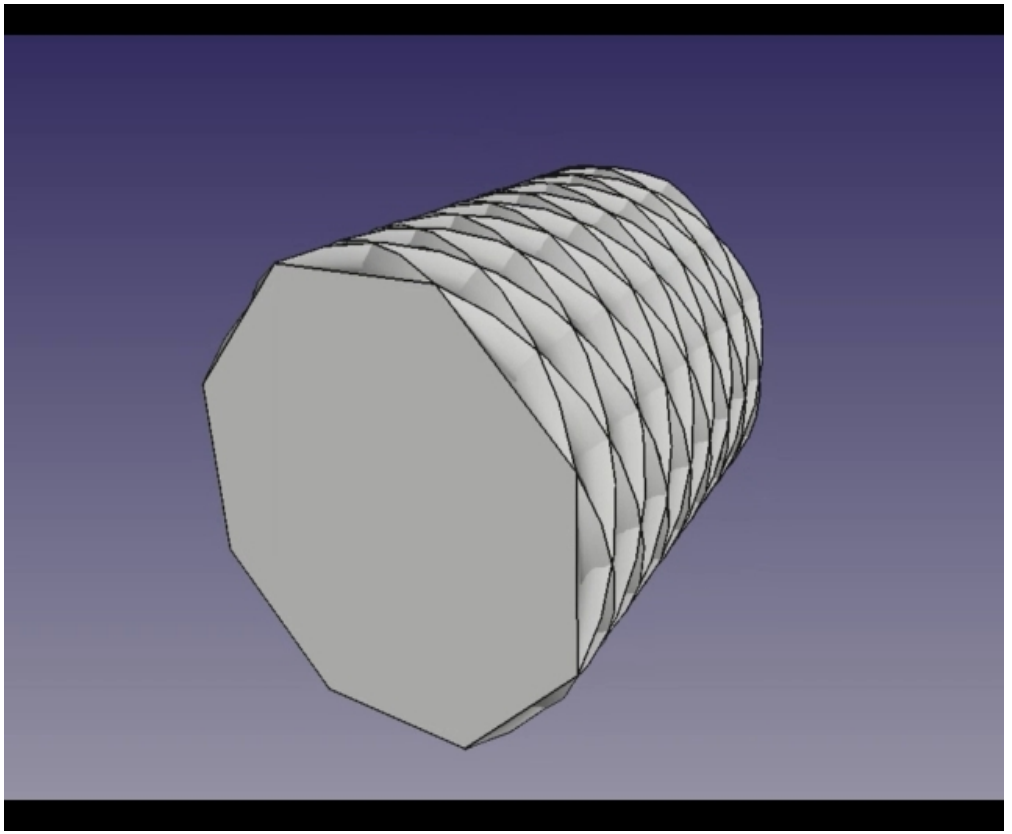
- Commercial
  - 3d
    - Fusion 360 from Autodesk
    - SolidWorks
    - CorelCAD
  - 2d
    - Eagle CAD
    - Adobe Illustrator
    - Autodesk Maya
- Free and Open Source
  - 3d
    - TinkerCAD
    - Sketchup
    - FreeCAD
    - OpenSCAD
    - Blender
  - 2d
    - KiCAD
    - Inkscape

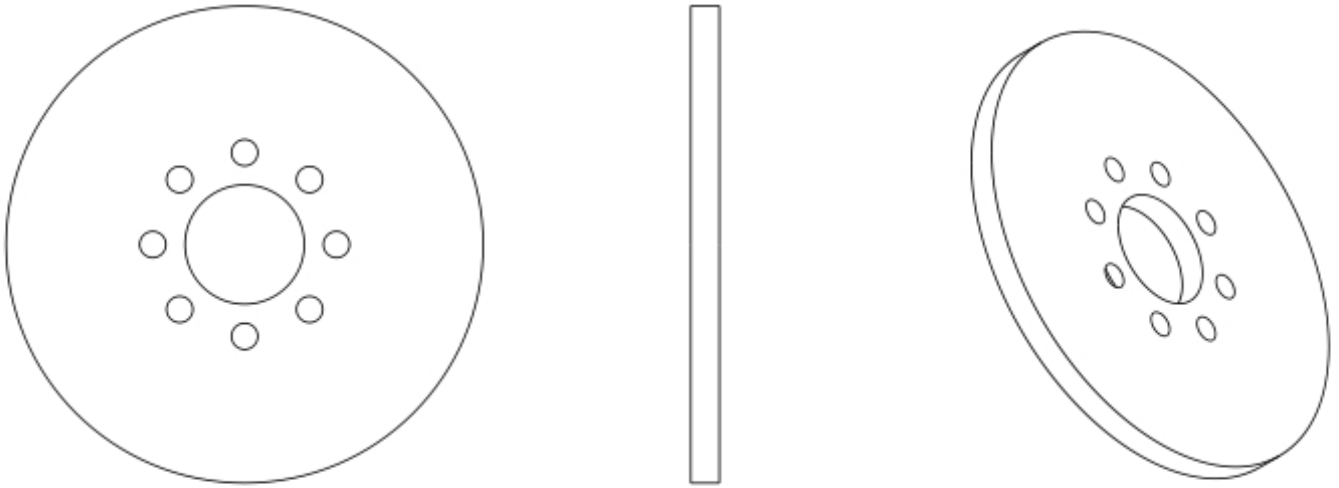


MUCH MORE

Materials

- Plastics
- Metals
- Wood
- PCBs
- Landscaping material
- Videos
- Much More!!





CAD Demo using FreeCAD

DESIGNED BY: Janelle Dahling		ActoBot Wheel	
DATE: CREATION D -			
CHECKED BY:			
DATE: CHECK DATE -			
SIZE A3			
SCALE SCALE	WEIGHT (kg) WEIGHT	DRAWING NUMBER NUMBER	SHEET SHEET

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Questions?

This presentation is available at:
https://github.com/RobotGarden/cad_intro

Appendix

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Additional References

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    - EagleCAD: https://cadsoft.io/
    - Adobe Illustrator: http://www.adobe.com/products/illustrator.html
  - Free or Free and Open Source
    - TinkerCAD - Free but not Open Source: https://www.tinkercad.com/
    - Sketchup - Free but not Open Source: http://www.sketchup.com/
    - FreeCAD - Free and Open Source:http://www.freecadweb.org/
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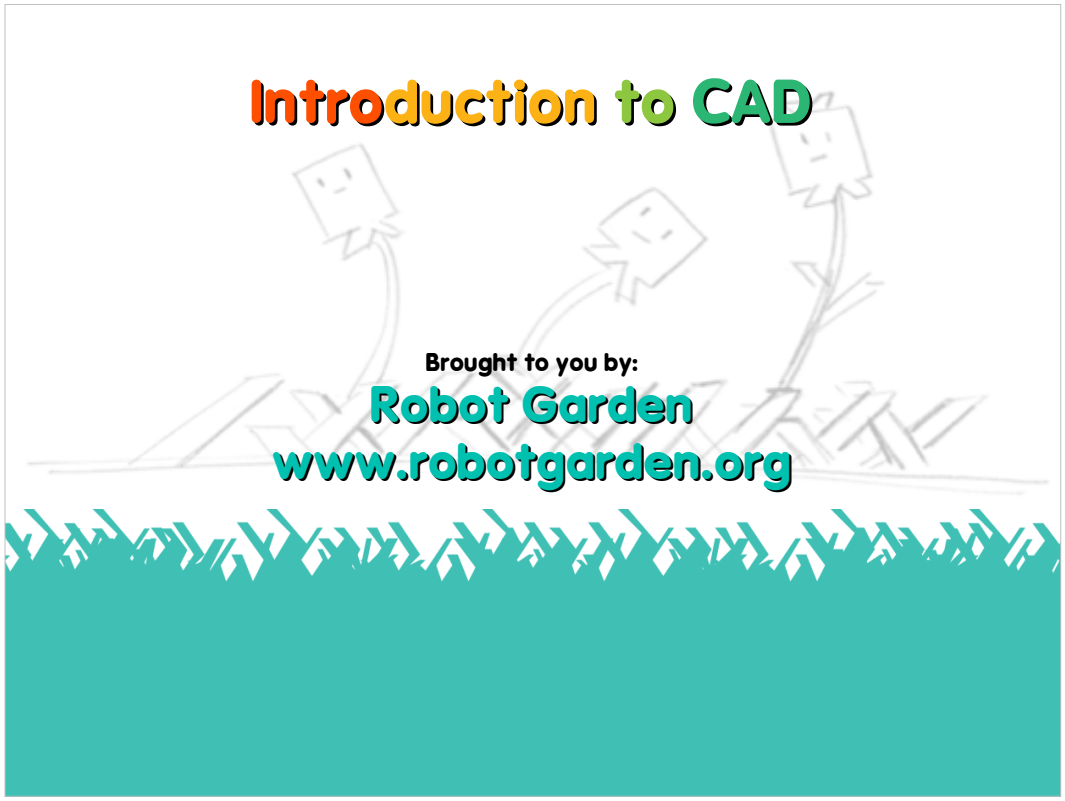
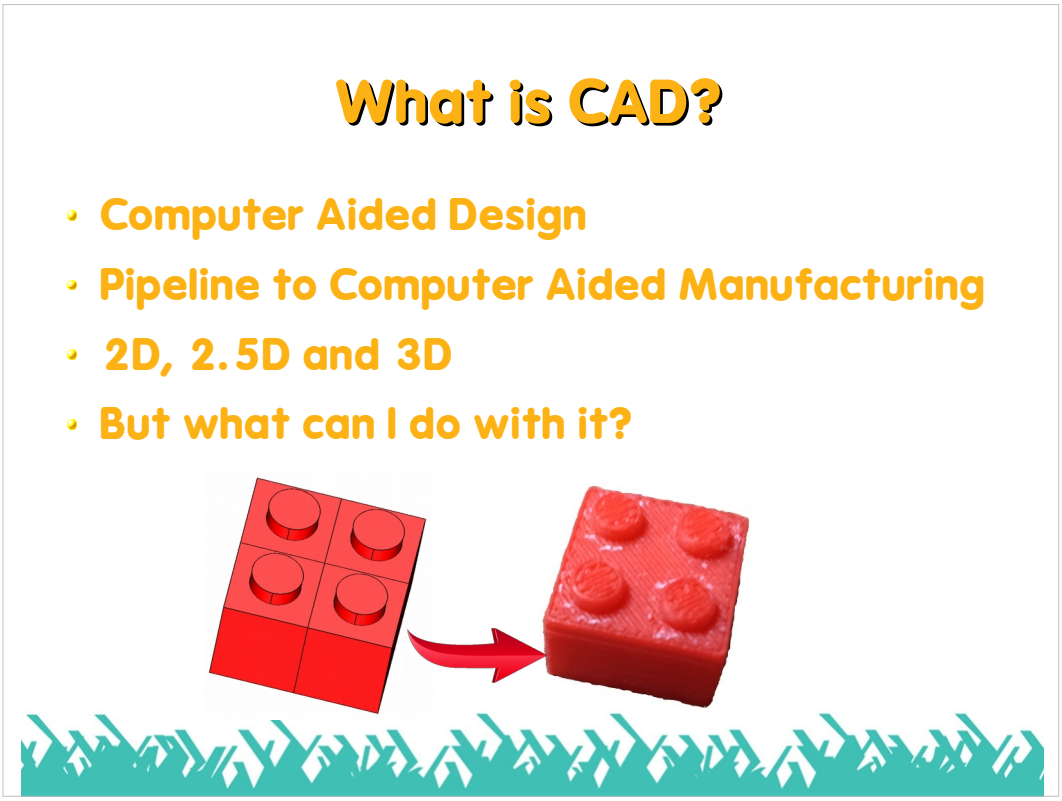
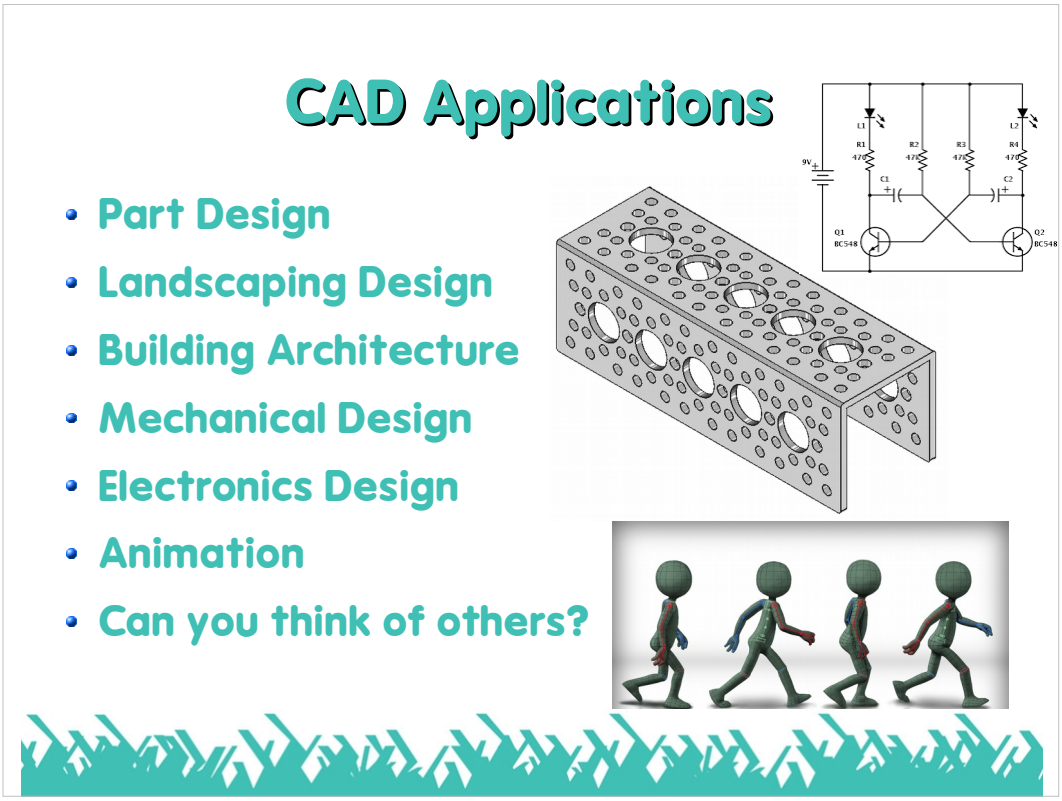


What brought you to this class? Did you have something in mind to make?

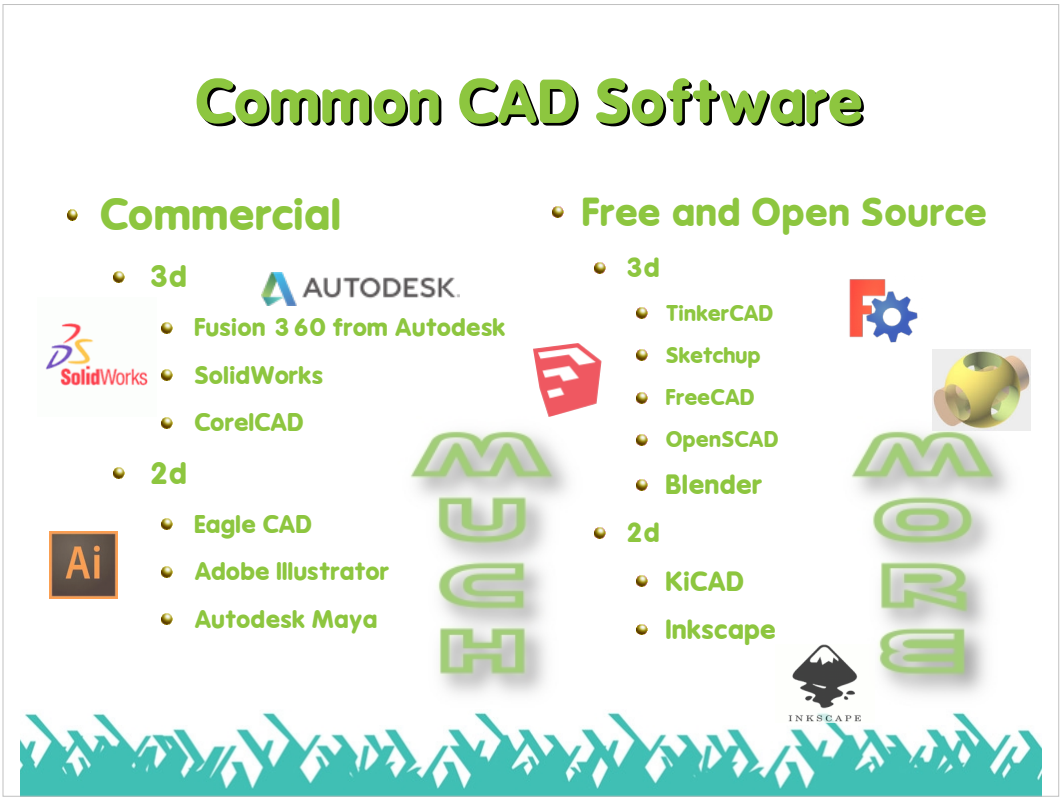


* If you've ever used paint or a similar program to create or manipulate a picture, you've experienced computer aided design! When I was a kid I remember having all sorts of ideas that I never felt like I could bring to life simply because what I could do artistically did not live up to what I envisioned in my mind. CAD has changed that entirely for me!
* Describe the maker movement – power of manufacturing in the hands of the people! CAD is a gateway technology to making things through CAM
* There are many applications for CAD, as I mentioned, even image manipulation is CAD and in fact there are many 2D applications. For example, blueprints, electronics schematics, etc. 2.5D comes in when you're dealing with a three dimensional object that has only horizontal and vertical surfaces. This doesn't matter in the modeling phase, but can be greatly important when you want to manufacture the part since 2.5D is a much simpler process than true 3D. And of course full fledged 3d.



As I mentioned, there are many applications that benefit from CAD. Listed on this page are some, but by no means all of them. As you can imagine, this is a very empowering technology used in many technical fields. In fact I've spoken with educators who say that students that have had some exposure to CAD have a leg up when they go to college. Listed here are some that I will describe in case you don't know what I'm referring to.

* Part Design – just as it sounds – you have a part or solid you need to model and create. Think knobs, gears, brackets and the likes
* Landscaping and Building architecture are probably familiar to most people but if not, please just ask.
* Mechanical designing is where parts come together to make working machines – imagine a set of gears coming together and rotating
* Electronics schematics are used anytime you have a piece of electronics and need to design circuits and the likes.
* Yes even Animation is a form of CAD and there are softwares out there to aid in creating tese
* Even more beyond this!



The list here is by no means exhaustive, nor does it cover the spectrum of applications we just went through. If you're truly interested in CAD, you should spend a little time researching the type of CAD program that would meet your needs best. Let me talk a little bit to each of these programs

* Fusion 360 – best suited for parts and mechanical design – can also do CAM. Free for inventors, but quite pricey if you intend to use it for commercial application
* SolidWorks – best suited for parts and mechanical design. Major competitor to Fusion 360 – takes into account materials and their properties
* CorelCAD – parts and mechanical design, but at a much lower cost than Autodesk or Solidworks softwares
* Eagle CAD is commercial CAD designed specifically for circuit/electronics design
* Adobe Illustrator is a vector graphics software used for 2D manufacturing such as laser cutting and engraving
* Autodesk has an offering in nearly every CAD application and their vector graphics software is called Maya
* TinkerCAD – geared for easy adoption with an intuitive interface. Often used for kids and mostly in the parts design space
* Sketchup is 3D CAD geared more towards room and building designs
* FreeCAD is largely a parts design tool, although it is actively being developed to do more in the future
* OpenSCAD brings a development based UI to parts design. You literally write the code that makes the objects
* Blender is a software for creating Animations
* KiCAD is a competitor to Eagle CAD and is used in electronics/electrical schematics
* InkScape is a free and open source vector graphics software similar to Illustrator

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- Plastics
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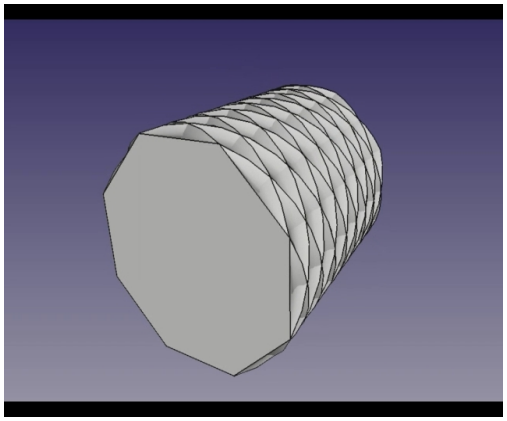
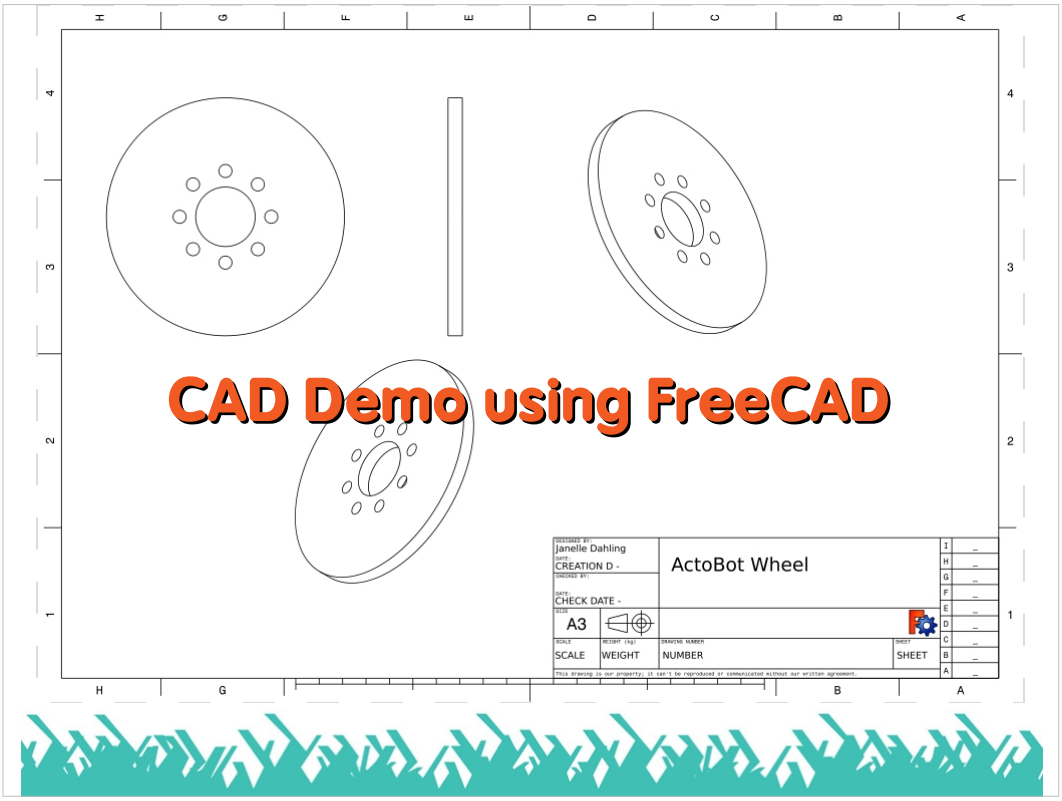
- Much More!!



Although CAD is strictly part of the design phase, it is still important to keep in mind the materials that are being targeted for what you're creating since it can impact the process. For example, in 3d printing through a common extrusion style printer where there is a nozzle ejecting melted material in layers to form an object, if you design something with sharply overhanging faces, you might have troubles, so the best orientation of the part may be laying on it's side or even upside down!

It's also important to think about the type of manufacturing you will be utilizing. Additive as in the 3d printing example or subtractive where you might be using a CNC Mill, laser cutter or similar technology.

Finally the process of CAM should be a consideration – complexity goes up as more dimensions come into play – 2D is very simple for example on a laser cutter or simple CNC milling. 2.5D greatly simplifies the process of creating a part with a CNC mill over 3D and of course true 3D with curves and the likes is the most complicated CAM process.



Now I’m going to shift gears and bring up some videos I’ve made while creating and manipulating objects in FreeCAD to give you a sense of how the tool works and then I’ll give you a chance to ask any questions you have.

This slidedeck is in LibreOffice and PDF format and a copy can be obtained at the Robot Garden github site, located here at the url listed on this page. The QR code to the right will take you to the same location: https://github.com/RobotGarden/cad_intro

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Appendix

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