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ECE 4160/5160

MAE 4910/5910

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Ethics I

Ethos, Pathos, and Logos

- Ethos: establishing credibility
- Pathos: appealing to emotion
- Logos: appealing to logic

- As engineers, what is the responsibility we have to technology, our colleagues, and society?
- **Micro-Ethics**
  - Concerned with individuals and the internal relations of the engineering profession
- **Macro-Ethics**
  - Concerned with the collective, social responsibility of the engineering profession and societal decisions about technology

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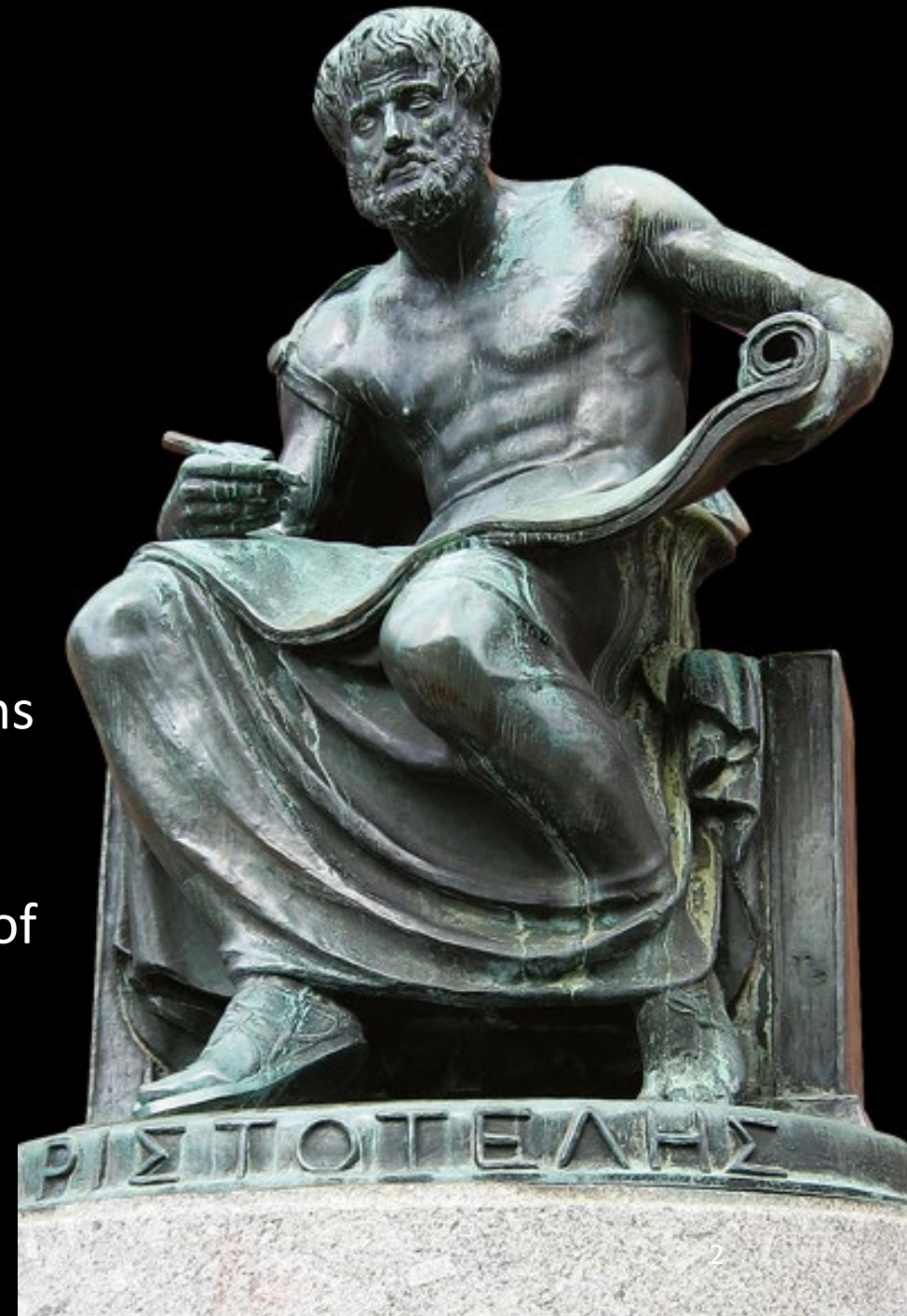
Ethos, Pathos, and Logos

- What ethical dilemmas have you faced in this class?

- Who are the stake holders?
  - You, Cornell, current and future students, future employers, DIY makers, the public

- Dilemmas
  - Public or private website
  - When to upload solutions
  - How truthful to be about online hand-ins/videos
  - Etc.

Macro-ethics

Micro-ethics

- Which decisions are related to micro/macro ethics?

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Micro-Ethics

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THE FUNDAMENTAL PRINCIPLES

Engineers uphold and advance the integrity, honor and dignity of the engineering profession by:

I. using their knowledge and skill for the enhancement of human welfare;
II. being honest and impartial, and serving with fidelity the public, their employers and clients;
III. striving to increase the competence and prestige of the engineering profession; and
IV. supporting the professional and technical societies of their disciplines.

THE FUNDAMENTAL CANONS

1. Engineers shall hold paramount the safety, health and welfare of the public in the performance of their professional duties.
2. Engineers shall perform services only in the areas of their competence.
3. Engineers shall issue public statements only in an objective and truthful manner.
4. Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest.
5. Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.
6. Engineers shall act in such a manner as to uphold and enhance the honor, integrity and dignity of the profession.
7. Engineers shall continue their professional development throughout their careers and shall provide opportunities for the professional development of those engineers under their supervision.

Micro-Ethics

What is your personal code of conduct?

- Individual responsibility
  - Are your actions intentional, and are they intentional in the right way?

- Collective responsibility
  - What is your impact on the group?
  - Does your role support responsible conduct?
  - Will the group trajectory lead you to the right goal?

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Advice from Prof. Illah Nourbakhsh, CMU

- *Be actively aware*
  - Read as much as possible. Stay informed.
- *Deliberate*
  - You have to think about consequences, even if unpleasant.
- *Select action and inaction*
  - Selecting an action means actively selecting what not to do for lack of time.
- Optional: *Be exemplary*.
  - You may inspire others

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Macro-Ethics

Ethics – *formal methods*

- Utilitarian Test

- Justice Test

- Virtue Test

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Utilitarian Test / Best Outcomes

- Will this action produce the best outcomes for everyone affected?
- Are we maximizing good and minimizing harm for everyone affected?

- *The consequences/outcomes determine what is right or wrong.*
- *It is assumed that the ends justify the means; an action is right if it creates the best overall outcome.*

- Good outcomes can be measured by
    - Happiness and unhappiness (pleasure and pain)
    - Preferences of individuals
    - Money, as an indicator of preferences

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Utilitarian Test / Best Outcomes

Why is this a valid way to decide right and wrong?

- Everyone counts the same.
- Everyone wants to be happy/avoid being unhappy. Therefore, good is what makes the most happiness or least unhappiness regardless of who is affected.
- Considers *both* current and future stake holders!

the greater good

Utilitarian Test / Best Outcomes

Applying the test

1. Identify the alternative actions that are possible.
2. Identify the stakeholders who will be affected by these actions.
3. For each of the most promising alternatives, determine the benefits and costs to all stake holders.
   - Predict probable outcomes based on facts and experience
   - Include both short-term and long-term consequences
   - Consider the relative value of an outcome to different stake holders
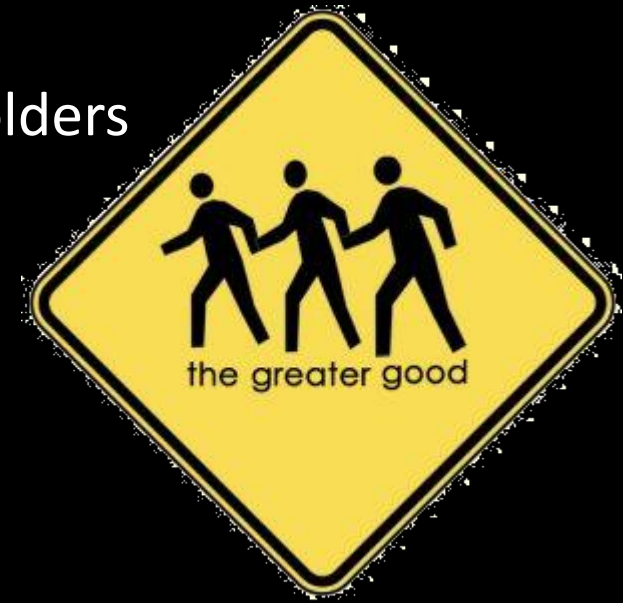
the greater good

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Utilitarian Test / Best Outcomes

Applying the test

1. Identify the alternative actions that are possible.
2. Identify the stakeholders who will be affected by these actions.
3. For each of the most promising alternatives, determine the benefits and costs to all stake holders.
4. Ask what would happen if the action were a policy for all similar situations.
   - First example often turns into a standard.
5. Draw a conclusion
   - If the same action is selected in Steps 3 & 4, then this is the ethical action.
   - If different actions are selected, then decide whether the individual action or the policy will produce the greatest good and the least harm, for all affected, over the long term

the greater good

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Utilitarian Test / Best Outcomes

Strengths
- Fact based!
- Emphasis on rational calculation and on including all stake holders
  - Our immediate intuitions about right and wrong cannot always be trusted!
- Requires striving for the best outcome and not simply a good outcome.

the greater good

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Utilitarian Test / Best Outcomes

Weaknesses

- Requires accurate probability assessments
- It may be difficult to focus on long term goods and harms
  - Human behavior is to outrun their mistakes by promotion, transfer, or retirement.
- Subject to several common errors when being applied:
  - *Limited Stakeholder Error*
  - *Short Term Error*
  - *Single Alternative Error*

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Justice Test

- Is this a fair distribution of benefits and burdens?

Why is this a valid test?
- If everyone is equal, then everyone has an equal claim to a share
- But everyone does not always have an equal claim
  - Work harder/less and contribute more/less
  - How to determine who contributes more?
    - Effort
    - Accomplishment
    - Contribution
    - Need
    - Seniority
    - Contract
    - Relationship

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Justice Test

Strengths
- Fair!
- And a basic instinct: *Subjects will give up rewards that would make them better off than they are, if others are getting greater rewards that are not justified.*

Weaknesses
- There is no single criterion for a fair distribution, so the test is always open to disagreement among ethical persons.

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Justice Test
Applying the Test

1. What is the distribution of burdens and gains?
2. Is the distribution fair?
   - Which criterion for distribution would be most fair in this situation?
   - Why would it be most fair in this situation?

Justice Test
Applying the Test

1. What is the distribution of burdens and gains?
2. Is the distribution fair?
3. If disagreement persists over which outcome is fair or over which criterion for inequality is best in the situation, then select a process to decide what is fair
   - Vote
   - Random

Justice Test
Applying the Test

1. What is the distribution of burdens and gains?
2. Is the distribution fair?
3. If disagreement persists over which outcome is fair or over which criterion for inequality is best in the situation, then select a process to decide what is fair
4. Draw a conclusion
   - Will this action produce a fair distribution, and why?

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Character / Virtue Test

- Does this action represent the kind of person I am or want to be?
- Does it represent my organization's reputation or vision of the kind of enterprise it wants to be?

Why is this a valid way to decide right and wrong?

- Important to self-judgement
- Influenced both by how we act and by what we aspire to be

Character / Virtue Test

Strengths

- Emphasizes that being an ethical person/company is not just a matter of following ethical rules, but involves developing habits of acting in the way that we and the society think that good people and companies should act.

Weaknesses
- Most of us don't act in a consistent way across different situations
  - You had a good day
  - It was that kind of a Monday…

Character / Virtue Test

Applying the Test

1. Will action help to make you the kind of person you want to be?
2. Will the action fit the company's reputation or vision of what it would like to be?
   - An individual's actions represent and affect not only him/her but also the firm or organization he/she works in.
3. Ask whether the action maintains the right balance between excellence and success for the firm?
   - Balance perfection and cost-effective products!
4. Draw a conclusion
   - Actions that fit yours/company virtues are good actions.

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Ethics – *formal methods*

- ## Utilitarian Test
  - Maximizing good
- ## Justice Test
  - Fair distribution of benefits and burdens
- ## Virtue Test
  - Does this match who you want to be?

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Robot Ethics

- Are there robots that shouldn't be created?

- Are there things that robots shouldn't do?

- If something goes wrong, who is responsible?

Derek Bacon
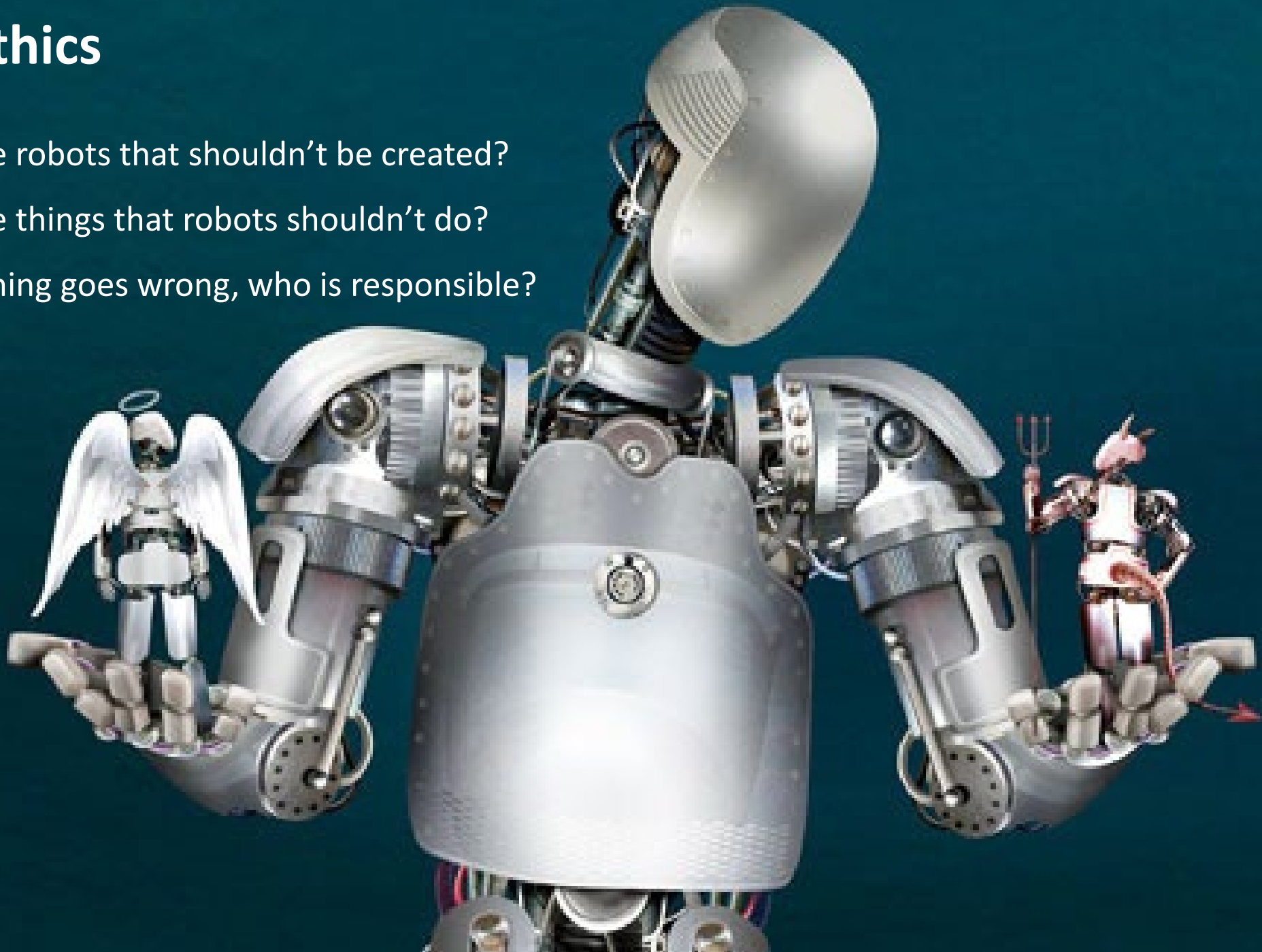
Robot Surgeons

- 1.7M procedures in the US between 2000-2013
  - Pros:
    - Reduced risk of infections
    - Faster healing
    - Robots do not get tired
    - The surgeon does not have to be on site
  - Against: Over 144 deaths, 1,391 injuries, 8,061 device malfunctions (FDA)

- *Who is responsible for errors?*
- *What are the security implications?*
  - *What about jobs/skills lost?*

Intuitive Surgical

Defense Robots

- *Mission: Reduce friendly casualties*
  - Reduce the number of personnel needed
  - Conduct combat over larger areas
  - Extend the reach of individual soldiers

- Human Rights Watch
  - Call for an outright ban of autonomous kill-systems

StratoEnergetics LIVE STREAM
http://www.stratoenergetics.com
Buenos Aires Event
TV Truck 02

https://www.stopkillerrobots.org/

Defense Robots

"For a significant period into the future, the decision to pull the trigger or launch a missile …, but it will remain under the full control of a human operator.

Many aspects of the firing sequence will be fully automated but <u>the decision to fire will not likely be fully automated until legal, rules of engagement, and safety concerns have all been thoroughly examined and resolved</u>."

NAS Distinctive Voices

Defense Robots

"Authorizing a machine to make lethal combat decisions is contingent upon political and military leaders resolving legal and ethical questions.

...

Ethical discussions and policy decisions must take place in the near term ... rather than allowing the development to take its own path apart from this critical guidance."

UNCLASSIFIED

United States Air Force
Unmanned Aircraft Systems Flight Plan
2009-2047

Headquarters, United States Air Force
Washington DC
18 May, 2009

NAS Distinctive Voices

Lethal Autonomy

Fast Robots

Lethal Autonomy

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Lethal Autonomy

- *Can robot soldiers be more humane than humans?*
  - Process more information faster (just statistics)
  - Incorporate the rules of war
  - Give a robot the right to refuse an order!
  - Monitor and report others
  - Robots don't have a right/desire to perform self-defense
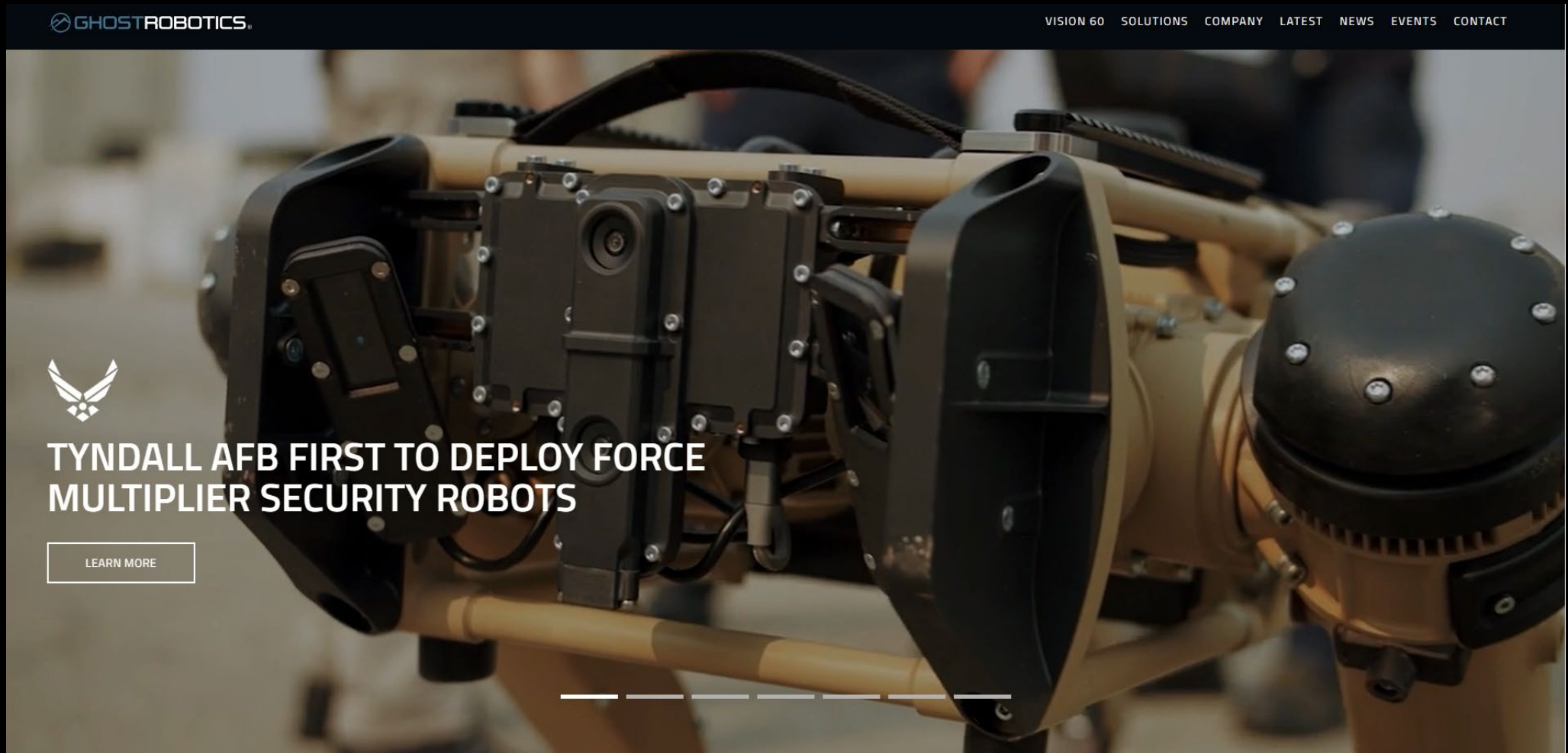- *What if others do it first??*

Hague Convention, 1899

THE GENEVA CONVENTIONS OF AUGUST 12 1949

INTERNATIONAL COMMITTEE OF THE RED CROSS

- *Very nuanced topic*
- *No clear answers*

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To help us start this conversion…

- …On the topic of *Ghost Robotics*

To help us start this conversion...

- 2021: Ghost Robotics installs a machine gun on quadrupedal robot...
  - SPUR "special purpose unmanned riffle"
  - 1,200m, 20x optical zoom, thermal
  - Remote controlled
  - Intended for "ISR/Comms" missions
    - intelligence, surveillance, reconnaissance, and communications
  - Essential military function: *Lethality*
  - **Autonomy??**
    - Navigation (capable)
    - Detect and lock-on to potential threats
    - Authorizing shots

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War accelerates tech

- WWI
  - Machine gun on a tank
- WWII
  - Aerial bombardment
- Ukraine war
  - FPV drones
  - Anti-drone tech
  - Lethal autonomy

  - *Legislation is needed!*

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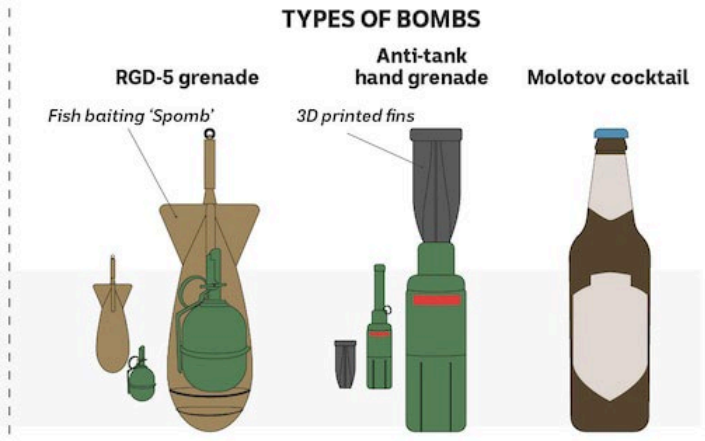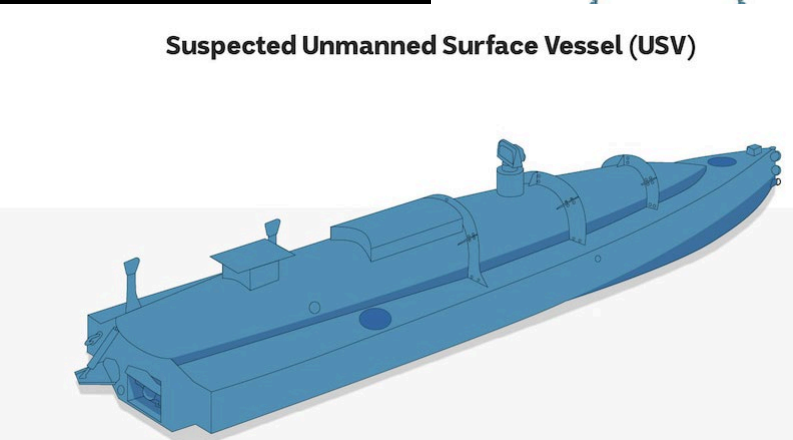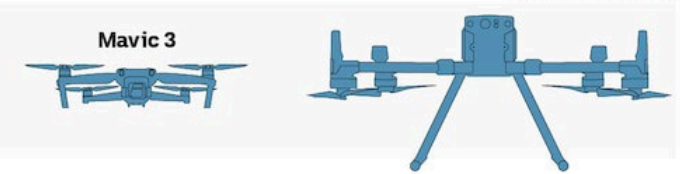
Solutions?

- Different ethical tests yield different answers
  - Compelling arguments can be made for either side
  - Which framework carries the most weight?
  - Remember to include all the stake holders!
    - Individual engineers, corporations, the public, government agencies and nongovernmental organizations
  - Remember to be realistic about economic, social and political constraints
- Creative solutions that could partially satisfy all stakeholders

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