Prof. Kirstin Hagelskjær Petersen
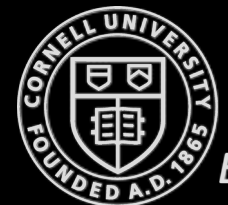kirstin@cornell.edu

# Fast Robots

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
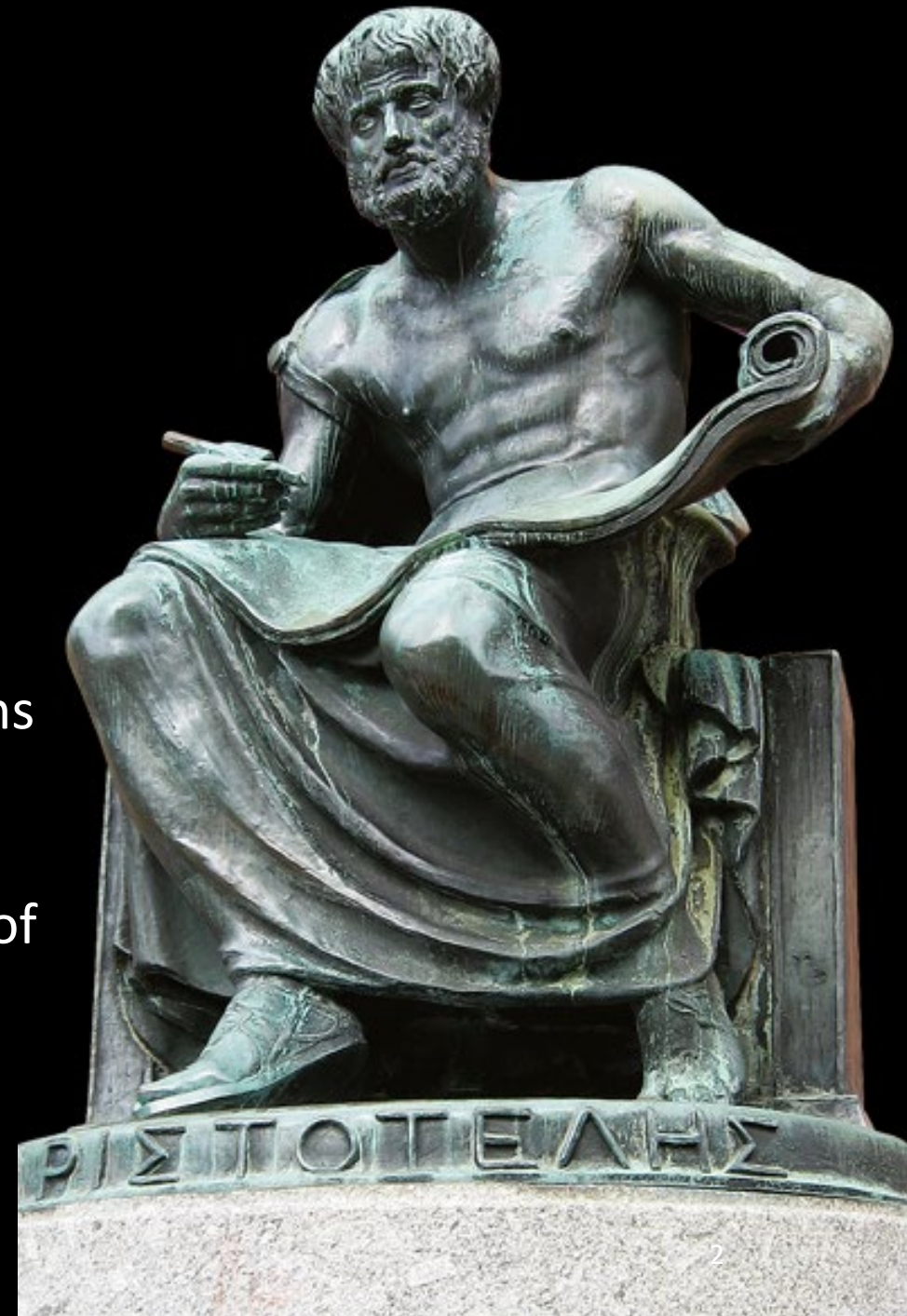
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Micro-Ethics
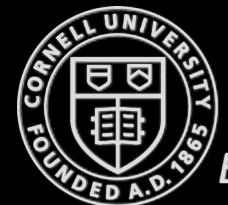
THE FUNDAMENTAL PRINCIPLES

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?

OLE MISS ENGINEER 2013-14

ENGINEERING SUPER CAREERS

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
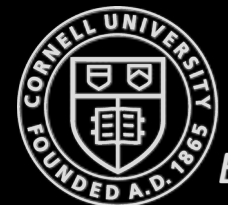
VW

- VW
- Audi
- Bentley
- Bugatti
- Lamborghini
- Ducati
- Porsche
- SEAT
- Skoda
- Scania
- MAN

- 150 countries
- 100 production facilities in 27 countries
- 600,000 employees
- No. 1 auto dealer in 2014

Environmental Protection

The Volkswagen Code of Conduct

We develop, produce, and distribute automobiles around the world to preserve individual mobility. We bear responsibility for continuous improvement of the environmental tolerability of our products and for the lowering of demands on natural resources while taking economic considerations into account. We therefore make ecologically efficient advanced technologies available throughout the world and implement them over the entire lifecycle of our products. At all of our locations, we are a partner to society and politics with respect to the configuration of social and ecologically sustainable positive development.

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Consequences (anno 2017)

- Civil claims in the U.S.: $14.7 Billion
- U.S. dealers: $1.2 Billion
- Justice Departments criminal and civil investigation: $4.3 Billion
- Stock price fell by more than 30%
- 2015 VW net loss: $1.83 billion
  - …Compared to 2014 VW net gain: $12.59 billion

Consequences

- The CEO and the board of directors were fired
- 6 higher-ups were indicted, another 40 charged with destroying evidence
- "Automaker Volkswagen said Friday it will shed 30,000 jobs to cut costs as it tries to recover from its diesel emissions scandal and invests more in electric-powered vehicles and digital services."
- "Volkswagen Group, with its multiple brands, has more than 600,000 employees but the cuts will mainly fall on its 120,000-strong German workforce."
- "Company officials said at a news conference at headquarters in Wolfsburg, Germany, that 23,000 of the job cuts will come in Germany. It said the measures will save some $4 billion a year from 2020."

Micro-Ethics

Concerned with individuals and the internal relations of the engineering profession

- Why would engineers who knew better, do this?

- Why would managers allow this?

- Why didn't someone at Bosch and VW blow the whistle?

- Up to 50 employees stepped forward

- Incentive was a cut of lawsuit fine

Macro-Ethics

Concerned with the collective, social responsibility of the engineering profession and societal decisions about technology

Ethics – *formal methods*

- Utilitarian Test

- Justice Test

- Virtue Test

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

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!

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
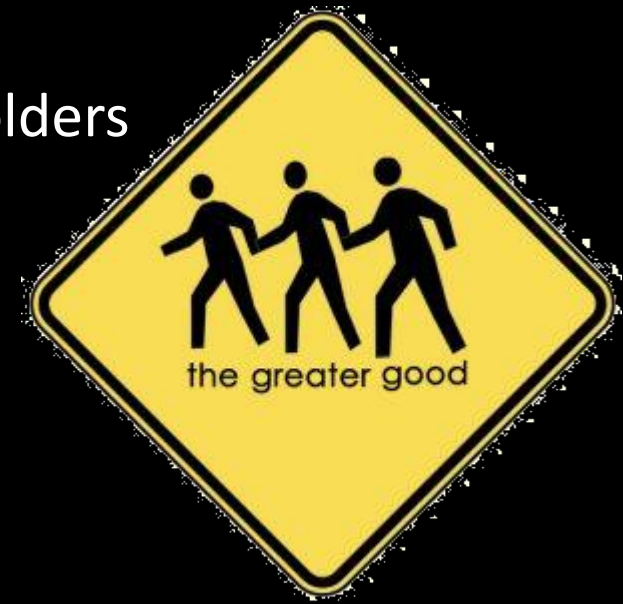
the greater good

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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

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
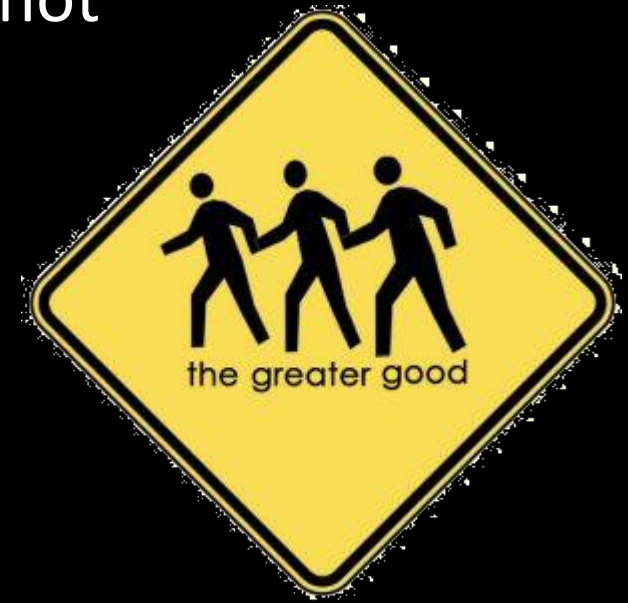
Utilitarian Test / Best Outcomes

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*

the greater good

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

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.

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?

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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

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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.

Back to the VW scandal

Should security researchers and/or the general pubic be allowed to study and modify automobile software code?

Fyi!

- High-end cars can have 100 million or more lines of code
- Errors in software code can be a threat to public safety
  - Ford has recalled 432,000 cars because of faulty code that could cause the engine to keep running even after the driver had turned it off.
  - Toyota recalled 625,000 hybrid cars whose software could cause them to stop suddenly.
  - A 2005 Toyota Camry accelerated through an intersection, killing one passenger and injuring the other.

Fyi!

- 2015: Two security researchers were able to control the air conditioning, sound system, and windshield wipers of a 2014 Jeep Cherokee.

- They eventually managed to turn it off while driving on the highway.

- Disclosed the vulnerabilities to GM about 9 months before sharing the results at a conference.

Which test is more suitable?
Apply Utilitarian Test

- By making the code accessible to the owners and security researchers, deceptive acts like Volkswagen's could be caught sooner!
  - Less emissions, better health for the public and the environment!
  - Security vulnerabilities could be discovered and patched sooner
  - More debuggers could mitigate flawed software and safety risks
  - Maybe open the market for 3rd party sw companies
  - More personalized driving experiences
      - …but then everyone could try to skirt EPA…
      - …might make it easier for hackers…
      - …No financial incentive which might discourage innovation…

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?