
Dependable Systems

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Training Exercises PT6 (Reconstruction)

with Example Solutions

Issue 1: *Argument*

The following snippet is a translation from the famous novel *Die Känguru-Offenbarung* by Mark-Uwe Kling (chapter "Eine Koryphäe"). The two main characters, Mark-Uwe and a talking kangaroo, are trying to prevent the teardown of a block of social housing. They are talking to the person in charge, right-wing extremist Jörn Dwigs, a mayor antagonist in the book.

> "The Ministry for City Security, founded and ran by me, takes a firm stand on this," said Dwigs. "In social housing, foreigners are settling down. Most foreigners are not allowed to work. That means, they either are not earning money and who has no money, turns to crime, or they are working illegally, which is a crime. Foreigners, who are working, are stealing jobs from us Germans and stealing is a crime. And as we say 'Zero tolerance for crime', this also means 'Zero tolerance for foreigners'."

Find an adequate and valid extended standard form of the argument he gives for the polemic phrase "Zero tolerance for foreigners" and give its logical form. Jörn Dwigs obviously is false here, but why? Try to find as many attacks to the argument as you can.

Sketch of a Solution 1:

Note that this is only one way of reconstructing the argument! There are other equally good reconstructions that are very different to this reconstruction.

Standard form:

Argument: Standard Form

P1:	If a foreigner is not allowed to work, they do not work or they work illegally.
P2:	If a foreigner does not work, they have no money.
P3:	If a foreigner has no money, they turn to crime.
C1:	*Therefore,* if a foreigner does not work, they turn to crime. (P2, P3)
P4:	If a foreigner works illegally, they are committing a crime.
C2:	*Therefore,* if a foreigner is not allowed to work, they turn to crime or they are committing a crime. (P1, C1, P4)
P5:	If a foreigner is allowed to work, they do not work or they steal jobs from Germans.
P6:	If a foreigner steals jobs from Germans, they are committing a crime.
C3:	*Therefore,* if a foreigner is allowed to work, they turn to crime or they are committing a crime. (C1, P5, P6)
P7:	If a foreigner turns to crime or they commit a crime, they are criminals.
C4:	*Therefore,* if a foreigner is not allowed to work, they are criminals. (C2, P7)
C5:	*Therefore,* if a foreigner is allowed to work, they are criminals. (C3, P7)
P8:	All foreigners are allowed to work or are not allowed not work.
C6:	*Therefore,* all foreigners are criminals (C3, C4, P8)
P9:	If all foreigners are criminals and we have zero tolerance for crime, then we have zero tolerance for foreigners.
P10:	We have zero tolerance for crime.
C:	*Therefore,* we have zero tolerance for foreigners. (C5, P8, P9)

Premise P8 is a logical truth and therefore it technically is an unnecessary premise, but it makes the argument a lot easier to read, which is why we included it nevertheless.

Logical form:

F is the set of all foreigners, ZTC and ZTF are shorthand and have to be read as nullary predicates that are true if we have zero tolerance for crime and zero tolerance for foreigners, respectively. This is not actually part of first-order logics, but makes life easier, so we will use it here.

Argument: Logical Form

P1:	$\forall x \in F : \neg allowedToWork(x) \rightarrow (\neg works(x) \vee worksIllegally(x))$
P2:	$\forall x \in F : \neg works(x) \rightarrow \neg hasMoney(x)$
P3:	$\forall x \in F : \neg hasMoney(x) \rightarrow turnsToCrime(x)$
C1:	$\forall x \in F : \neg works(x) \rightarrow turnsToCrime(x)$ (P2, P3)
P4:	$\forall x \in F : worksIllegally(x) \rightarrow commitsCrime(x)$
C2:	$\forall x \in F : \neg allowedToWork(x) \rightarrow turnsToCrime(x) \vee commitsCrime(x)$ (P2–P4)
P5:	$\forall x \in F : allowedToWork(x) \rightarrow \neg works(x) \vee stealsJobs(x)$
P6:	$\forall x \in F : stealsJobs(x) \rightarrow commitsCrime(x)$
C3:	$\forall x \in F : allowedToWork(x) \rightarrow \neg turnsToCrime(x) \vee commitsCrime(x)$ (C1, P5, P6)
P7:	$\forall x \in F : (turnsToCrime(x) \vee commitsCrime(x)) \rightarrow isCriminal(x)$
C4:	$\forall x \in F : \neg allowedToWork(x) \rightarrow isCriminal(x)$ (C1, P7)
C5:	$\forall x \in F : allowedToWork(x) \rightarrow isCriminal(x)$ (C2, P7)
P8:	$\forall x \in F : allowedToWork(x) \vee \neg allowedToWork(x)$
C6:	$\forall x \in F : isCriminal(x)$ (C3, C4, P1)
P9:	$(\forall x \in F : isCriminal(x) \wedge ZTC) \rightarrow ZTF$
P10:	ZTC
C:	ZTF

The argument is not sound because there are some wrong premises:

P2 P2 is false, because there can be other ways to obtain money than working, e.g. being supported by a working family member, receiving benefits from a governmental welfare system or NGOs, or just being so rich that you do not have to work.

P3 Again, foreigners without work could try to obtain money via legal ways.

P5 The talk of 'stealing' jobs does not make a lot of sense to me, anyway – refer to exercise sheet about conceptual work (if you study this at a point where you already did the exercise sheet on conceptual work). And even if we suppose that it did make sense, there still are clear counterexamples: if only foreigners apply for a position, they clearly did not 'steal' it from Germans.

P6 What is usually called "stealing a job" is quite clearly not a crime.

P8 "Having zero tolerance for" is likely an intensional context and it is at least questionable that P9 holds. (But that's not the main problem of the argument.)

Issue 2: *Reconstruction*

Charitably reconstruct the main arguments from the following texts:

1. Study after study confirms what is long known: the gender pay gap is a real thing. Recently a sector that was not in the media's focus so far made its way into the spotlight of pay gap reports. Women in the IT sector, one of the stereotypically male domains, suffer from the gender pay gap,

too. In the tech industry, there is an adjusted wage gap of 5.4 percent, meaning that a man gets, on average, 5.4 percent more wage that a woman in a similar position. This is not only unfair, but counterproductive for the whole sector. The tech industry is taking all kinds of measures to attract more women, so it would be only logical to pay them as well as their male colleagues. There is a strong culture among tech folks that values skill and competence above all. If you are a talented programmer, a clever researcher or a good engineer, you will be held in high esteem. Which gender you have will usually become unimportant as soon as people get to know you and it should be equally irrelevant for your payslip.

2. Algorithms pervade our lives today, from music recommendations to credit scores to now, bail and sentencing decisions. But there is little oversight and transparency regarding how they work. Nowhere is this lack of oversight more stark than in the criminal justice system. Without proper safeguards, these tools risk eroding the rule of law and diminishing individual rights.

   (taken from Jason Tashea, "Courts Are Using AI to Sentence Criminals. That Must Stop Now", 2017, in *Wired*, `https://www.wired.com/2017/04/courts-using-ai-sentence-criminals-must-stop-now/`)

3. Once a [crime] pattern is detected, the information can be used to predict, anticipate and prevent crime. [...] Machine learning can be a tremendous tool for crime pattern detection, and for predictive policing in general. If crime patterns are automatically identified, then the police can immediately try to stop them. Without such tools, it could take weeks or years of [manually] sifting through a database to discover a pattern, or it might be missed altogether. [A certain machine learning approach] provides an important data-driven approach to a very hard problem in predictive policing. It's the first mathematically principled approach to automated learning of crime series.

   (taken from Cynthia Rudin, "Predictive Policing: Using Machine Learning to Detect Patterns of Crime", 2013, in *Wired*, `https://www.wired.com/insights/2013/08/predictive-policing-using-machine-learning-to-detect-patterns-of-crime/`)

4. Many of us will need help. The simplest — and probably the most important — thing you can do is take precautions like [physical] distancing. That's the only way to flatten the epidemic curve. [...] If you're among the less vulnerable, it's tempting to ignore most of this. Why suffer the inconvenience if the personal risk is low? The only answer is that others are counting on you. And it's almost certainly true that someone in your life — a parent, a grandparent, a friend with an existing medical condition — is counting on the people in their community to do the same. Because all of us, even the most at risk, will have to venture into the world at some point, and the fewer infected people there are, the safer everyone will be. Halting this virus is a collective task no matter how you look at it.

   (taken from Sean Illing, "This is a time for solidarity", 2020, in *Vox*, `https://www.vox.com/2020/3/13/21172237/coronavirus-covid-19-albert-camus-the-plague`)

5. It had all started so well. On 1 April, 130 scientists and entrepreneurs presented an approach under the name PEPP-PT that would help contain the new coronavirus: With their concept, countries across Europe should be able to build data protection-friendly apps that work across borders. [...]

   [But now a global alliance of more than 300 scientists has formed], who clearly distance themselves from the path taken by PEPP-PT. [...]

   One part of the initiative favours a decentralised approach. This means that the stored data would only be used locally: If two smartphones are located a few meters apart, they exchange randomly generated and constantly changing identification numbers via bluetooth and store them on the device. [...] However, they do not know who the person is, nor is this information stored in any [central] database. [...]

Another part of the initiative prefers a centralised approach. [...] If you download the app, it is registered once on the central server and receives a permanent identification number. [...] If someone became infected, they would send their contact list – i.e. the randomly generated identification numbers of the smartphones they got close to – back to the central server, which would then warn them. [...]

A general criticism of the central approach: if data is collected in one place, it could be misused. If the data was on a central server, this would enable "a form of surveillance by the government or the private sector" which would "catastrophically damage trust in an app and its acceptance in society," according to the open letter from the scientists, which researchers from many important universities have signed – from Oxford to Stanford, from ETH Zurich to Johns Hopkins University, from Ruhr University Bochum to the Catholic University of Leuven. "It is crucial that in tackling the current crisis we do not create an instrument that would allow for large-scale collection of data on the population, either now or in the future". Solutions that would allow tracking personal data of millions of users should be rejected "without discussion". [...]

The centralized and decentralized approaches differ fundamentally in the way in which privacy is to be given, says Kenneth Paterson, Professor of Computer Science at ETH Zurich and one of the initiators of the open letter, in an interview with ZEIT ONLINE. [...] But neglecting privacy is "extremely dangerous". [...]

(translation of Lisa Hegemann, "Wissenschaftler warnen vor 'beispielloser Überwachung'", 20 April 2020, in *ZEIT ONLINE*, `https://www.zeit.de/digital/datenschutz/2020-04/corona-app-initiative-pepp-pt-datenschutz-warnung-forscher`)

6. The expression "139,378 COVID-19 deaths" implies that the NCoV caused the death of 139,378 humans, in the same sense in which taking in potassium cyanide causes the death of a man. But in fact it is not investigated at all how much the NCoV contributed to these deaths. It is not even investigated whether NCoV contributed anything to these deaths. Probably, some of them died of heart attack, and NCoV contributed nothing to their death. Probably, some of them were infected by Influenza A and then got pneumonia with streptococcus pneumoniae, and NCoV contributed little or nothing to their death. Therefore the numbers of "Covid-19-deaths" which are being published in realtime by WHO, CDC, and RKI provide no evidence that these deaths were caused by NCoV. A rational person does not allow his opinion about how dangerous the NCoV is to be influenced by these numbers at all. The only thing these numbers show is that the WHO, CDC, and RKI want to make people believe that the NCoV is dangerous.

   (taken from Daniel von Wachter, "In Four Steps to the Truth about the New Coronavirus", 18 April 2020, `https://von-wachter.de/cov/steps.htm`)

Bonus: How can you attack these arguments?

Sketch of a Solution 2:

Note that all of the following shows only one way of reconstructing each argument! There are other equally good or maybe even better reconstructions that are very different to these reconstructions. If your reconstruction looks completely different to our example, then this does in no way mean that your reconstruction is bad.

1. Toy example:

Argument:

P1:	The gender pay gap in the IT sector is unfair.
P2:	The tech industry is taking many measures to attract more women.
P3:	If P2, then the gender pay gap in the IT sector is counterproductive to the whole sector.
P4:	If the gender pay gap in the IT sector is unfair and counterproductive to the whole sector, then the gender pay gap in the IT should be closed.
C:	The gender pay gap in the IT sector should be closed.

2. Jason Tashea, "Courts Are Using AI to Sentence Criminals. That Must Stop Now":

Argument:

P1:	There is little oversight and transparency regarding how certain algorithms work.
P2:	These certain algorithms are used in the criminal justice system.
P3:	If P1 and P2, then the use of certain algorithms without proper safeguards risks eroding the rule of law and diminishing individual rights.
C:	The use of certain algorithms without proper safeguards risks eroding the rule of law and diminishing individual rights.

3. from Cynthia Rudin, "Predictive Policing: Using Machine Learning to Detect Patterns of Crime":

Argument:

P1:	Manual crime pattern detection is very unreliable and time-consuming.
P2:	Machine-learning assisted crime pattern detection is relatively accurate and fast.
P3:	If P1 and P2, then machine learning can be a tremendous tool for predictive policing.
C:	Machine learning can be a tremendous tool for predictive policing.

4. Sean Illing, "This is a time for solidarity":

Argument:

P1:	Even those who are in the risk group have to leave their safe spaces at some point.
P2:	The fewer infected people there are in the world, the safer it will be for everyone to be outside of their save spaces.
P3:	If P1 and P2, everyone has an altruistic reason to halt the corona crisis.
P4:	Most people know someone in the risk group who they do not want to be harmed.
P5:	If P1, P2 and P3, most people have an egoistic reason to halt the corona crisis.
P6:	The corona crisis can be halted only if people work together.
P7:	If P6 and everyone has an altruistic reason to halt the corona crisis and most people have an egoistic reason to halt the corona crisis, then halting the virus is a collective task no matter how you look at it.
C:	Halting the virus is a collective task no matter how you look at it.

5. Translation of Lisa Hegemann, "Wissenschaftler warnen vor 'beispielloser Überwachung'":

Argument:

P1:	If you should implement a corona tracking app, then you should take the centralised approach to a corona app or you should take the decentralised approach to a corona tracking app.
P2:	The centralised approach collects data in one place.
P3:	If the centralised approach collects data in one place, then data can be misused in the centralised approach.
P4:	If data can be misused in the centralised approach, then you should not take the centralised approach.
C1:	You should not take the centralised approach. (P2–P4)
C:	If you should implement a corona tracking app, then you should take the decentralised approach to a corona tracking app. (P1, C1)

6. Daniel von Wachter, "In Four Steps to the Truth about the New Coronavirus":

Argument:

P1:	It is not investigated, whether and how much COVID-19 contributed to the death of alleged COVID-19 deaths.
P2:	If P1, then it is probable that some of the alleged COVID-19 deaths had other causes than COVID-19.
P3:	If it is probable that some of the alleged COVID-19 deaths had other causes than COVID-19, then the official number of COVID-19 deaths is misleading.
C1:	Therefore: The official number of COVID-19 deaths is misleading. (P1–P3)
P4:	If C1, then the official number of COVID-19 deaths is no benchmark for the dangerousness of COVID-19.
C:	The official number of COVID-19 deaths is no benchmark for the dangerousness of COVID-19. (C1, P4)

Issue 3: *Team Work*

Reconstruct a team mate's argument in your next discussion and hand it to them. Is it what they wanted to say?