Introduction: Is the Robotic Future Open (for Knitting)?

Our worlds of the Global North are increasingly inhabited by a number of visual and textual narratives of a robot-technologies-driven future that seems to start already now. Or, in John Urry's (2016, 1) words, "Futures are now everywhere." Here, I am thinking of popular headlines in which the arrival of the robots is announced, especially, but not exclusively, in online media. These headlines report not only that "the robots are coming," but also what they are coming for. In most cases, they depict the robotic arrival as hostile and that the robots are coming "to steal our jobs".[1] At the same time, there also exists an almost equivalent number of headlines that advertise a robotic future in which the robots are coming to serve as 'our' somewhat human-like companions that will be beneficial to 'us' and help 'us' in different social scenarios—from shopping to elderly and infant care.[2] Headlines might diverge on what the robots are coming for (hostile takeover or beneficial assistance), but what seems to be indisputable is that the robots *are* coming.

This inevitability of "the robots are coming" is at the heart of the contemporary sociotechnical imaginary[3] of robotic futures. It also carries an inescapability with it: the presence of robots as future social agents feels overwhelmingly ubiquitous and quite confusing. Contributing to this confusing

1 For a significant overview and collection of headlines, see *#notmyrobots* on Twitter, https://notmyrobot.home.blog. Further, to see the most recent visions, I suggest typing "the robots are coming" into the internet search engine of your choice.

2 On the figuration of "robotic companionship", see Treusch 2015.

3 I draw on the term imaginary as it has been "established in feminist studies that investigate different bio-technology-driven visions of societal futures and how these imaginings implement and negotiate understandings of subjectivity and sociality in regard to the realms of the present and the future" (Treusch 2015, 14). On *The Robotic Imaginary* see also Rhee 2018.

inescapability is the fact that it is almost impossible to get an overview of the literature written on this topic of 'our' future with robots. Nor is it easy to take stock of the different funding schemes for robotic research, the robotic initiatives, and various research locations. In addition, it is especially difficult to assemble the different opinions on what this future will look like with regard to fields of interaction, robot models, and the assumed social impact; therefore, it is equally difficult to evaluate whether 'we humans' should embrace this future, or not. The robotic future takes shape as something that is at the same time inescapable and yet rather intangible, evolving around opposing clear visions of robots as socially meaningful machines which will integrate into society, and as a threat that disrupts foundational beliefs in the role of machines as 'human tools', shaking society to its core. While the fact that "they are coming" appears crystal clear, their social impact seems to remain a topic for discussion, while the details of such an integration, especially in terms of 'our' everyday lives, remains largely unclear. Precisely this field of tensions between inescapability and intangibility, which I view as characteristic for what I frame as the contemporary robotic imaginary, seems to call for an either-or positioning towards the hegemonic picture painted of robotic futures: either a utopian, welcoming position or a dystopian, resistant position. There is a lot to lose if 'we' comply to this either-or formation—not only with regard to imagining more socially-just kinds of human-robot co-habitation, but also in transgressing some of 'our' foundational beliefs and legacies of the Global North regarding what it means to be human, in contrast to what it means to be a robot.

This book is a technofeminist intervention into the contemporary robotic imaginary and its either-or formation. It aims at situating the claim of "the robots are coming" within the debates on how robots will become socially meaningful agents as well as the concomitant practices of realising human-robot interaction (HRI). More precisely, it intervenes by establishing a collaborative practice which has not been implemented as a task of HRI so far, namely the task of collaborative knitting. Imagine walking into a robotic lab without a degree in robotics, but instead as an experienced, queerfeminist hand knitter who also happens to be a feminist science and technologies studies (FSTS) scholar, specializing in human-robot relations, bringing with you a pair of knitting needles and a ball of yarn. This setting alone might be considered an intervention as it sounds rather counterintuitive—if not fictitious—and requires an explanation. The handicraft of knitting and queerfeminist inquiry are not typically associated with the high-tech labs in which robot technolo-

gies are developed. However, looking at this setting more closely, it reveals its rootedness within the emerging field of *craft HCI* (*human-computer interaction*) (see Gross et al. 2013; Devendorf & Rosner 2015; Rosner 2018; Frankjaer & Dalsgaard 2018), and in my personal history of being interested in technofeminisms, robotics, and knitting. Both ultimately led to the situation described here: entering the robotic lab with a pair of knitting needles and a ball of yarn with the intent to realise human-robot knitting. Attached to this intervention, my role as a queerfeminist scholar in the robotic lab changed dramatically: from being an observer, a role with which I was already acquainted from previous research conducted at a robotic lab and on the engineering of robots as social agents (Treusch 2015), to becoming a robotics practitioner myself.

Entering the lab, I took a stance in my exploration of HRI where the goal of making a difference in debating and designing 'our' robotic future is not only to become part of the engineering of HRI, but also pivots around yarn as a material and metaphor—the red thread of this book—which enabled me to take on this role in the first place. As a knitter, I entered the lab with certain imaginations of what it would mean to make hand knitting our task of human-robot collaboration (HRC), necessarily involving an investment in the challenge of realising the handling of yarn between human and robot. At the same time, yarn in its metaphorical meaning functions as a navigational tool for exploring the contemporary sociotechnical robotic imaginary, identifying individual discursive strands in order to follow them, literally tracing that which is and that which might not yet be possible, in human-robot relations. Thus, my account of robotic knitting is grounded in my curiosity about how knitting with a robot collaboratively could challenge hegemonic narratives of the useful robot geared at helping us wherever needed *in theory and in practice.* Handling yarn then became my method to *enmesh myself* in the contemporary sociotechnical robotic imaginary on both levels: the level of discursive formations on robots as collaborative, social agents, and the level of everyday engineering practices as they take place in robotic labs. Such a becoming enmeshed is about exploring the possibilities of interrelating visions of future robots, practices of HRC, interdisciplinary knowledge, and needlework.

This book centrally builds on the experience of conducting research in, and on the resulting findings of, the interdisciplinary project *Do Robots Dream of Knitting? Re-Coding Human-Robot Collaboration (DRDK)*, funded by the Volkswagen Foundation and situated at a robotics lab at the Technical University Berlin from September 2018 until August 2019. It brings together a discussion of discourses that envision what 'our' robotic future might look like, but

also an exploration of laboratory practices of enacting robotic futures through knitting collaboratively, including the experience of causing irritation precisely because of the rather unintuitive idea of making knitting a task for HRC.

I posit robotic knitting as a methodological tool and analytical frame for contemporary technofeminism. Technofeminism, in line with Cornelia Sollfrank (2018, 3), enables forms of inquiring that "mean no less than struggling for a more just and liveable world for everyone in today's technoscientific culture." Clearly, robotic presents and futures are pivotal in raising questions of more just and liveable technoscientific worlds. Getting engaged in this struggle, I took up my knitting needles and yarn to use them as the tools for producing a tangible, textile artefact together with a cobot.

Beyond the challenge of producing a knitted artefact together, to knit collaboratively with a robot also became the use case for complicating taken-for-granted certainties of 'our' contemporary sociotechnical robotic imaginary. Implementing this use case for one cobot technology, however, is not oriented at, for instance, finding the obstacles in human-machine interaction in order to make human-machine relations at this interface more efficient. Rather, robotic knitting pivots around posing these questions: How are robotic futures imagined? On what kind of human-robot relations are these visions based? How are these articulated in existing robot technologies? And, what kind of collaboration are they in turn capable of? Tackling these questions through implementing the use case of collaborative knitting, I refuse to view the narrative of "the robots are coming" as announcing an already determined course that technology development in the future will take, but rather view it as constitutive of one of the core challenges of our times: to insist on the openness of tech development. This openness also implies that the future still needs to be written. In result, I regard the process of robotic knitting as the ideal interventionist practice and generative, playful engagement with an overwhelming, inescapable, yet open situation—a position which is rooted in Donna Haraway's (1985) cyborgian sense of feminist critique.

The knowledge on human-cobot relations assembled in this book is not comprehensive in a universalizing sense, but is *partial*. Based on Haraway's (1991) *situated knowledges*, generating knowledge necessarily involves situating knowledge claims within specific arrangements of time, space, materialities, and power relations. Power relations of the contemporary sociotechnical robotic imaginary articulate, for instance, in the current hegemonic understanding of the socially meaningful robot as necessarily human-like. In

her poignant analysis of the *robotic imaginary*, Jennifer Rhee (2018, 9) explains that "the metaphors we use to describe technologies are powerful actors that shape how we imagine, invent, and engage technologies and the world." In order to present the current and coming generations of robots as socially-meaningful future co-workers or workers, human-likeness has evolved into and has been established as the almost-unquestionable dominant metaphor used to describe future robotic worlds. Its legitimacy is thereby mostly based in the belief that it will guarantee that robots become socially meaningful on a large scale. Knitting collaboratively tweaks this category, as I will show in Chapter 2, by shifting the focus from human-like as the primordial category of mutual intelligibility between human and robot to the multi-dimensional practice of enacting collaboration between humans and robots.

What I am concerned with is not only the legitimacy of, or the desire for, imaginations and designs of somewhat human-like robots supposedly becoming social actors, in one way or another, and a labour source in every human sphere of capitalist production. What I am especially concerned with is the re-crafting of visions and concrete possibilities of how humans and robots can and should relate in the present and in the future, and who or what is involved in such re-craftings. According to Rhee (2018, 9), what is needed is "a more capacious vision of the robot, as well as the human". Pivotal for this book is a playful curiosity with knitting needles, yarn, and robotic artefacts as a resource for, and as agents in, developing a more capacious vision of entangled human-robot futures.

Entering a robotic lab with a pair of needles and yarn to then realise robotic knitting is a hands-on practice of intervening. Even though realising collaborative knitting between humans and a cobot appears to be a clear-cut goal, central to this project is the constant examination of the everyday practices of engineering through which we, the interdisciplinary team, are implementing this goal. Robotic knitting thus serves as a tool not only for probing taken-for-granted knowledges, but also practices of engineering such a goal, while at the same time, it also functions as a tool for re-engineering and telling a different story. This re-engineering and the story robotic knitting tells are based on bringing knitting needles, an interdisciplinary team, and a cobot together. The interventionist momentum of robotic knitting thus is at the same time disruptive and generative.

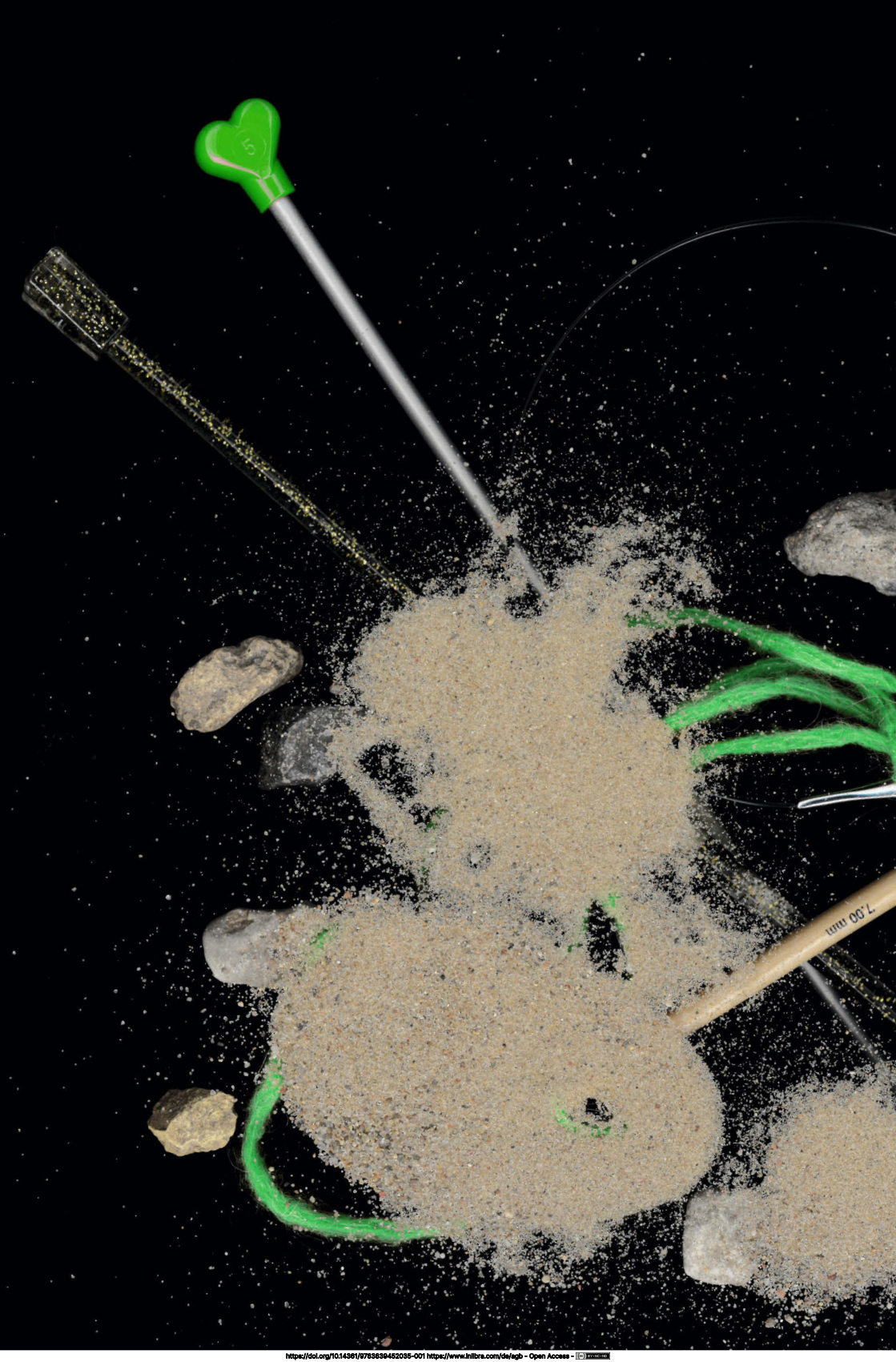
Robotic knitting's challenge of usefulness aligns with what Sara Ahmed (2019) recently terms *queer use*. Queer use is about bringing to the fore the potential of use beyond the mundane by exploring the question of: *What's the*

use? Guided by raising precisely this question, my queer use of the cobot as well as of hand knitting and its materials (needles and yarn), also necessarily involved complicating not only my account of automation, the idea of robots taking over as 'our' co-workers, and the underlying organisation of work, but also my idea of hand knitting. While exploring the cobot as (co-)worker is essential to the first chapter of the book, I will show in the second chapter how choosing hand knitting as the object of digital automation tweaked my account of textile creation.

Through the DRDK project, I am not only eager to explore the ways in which the robotic future is still open, but also whether it is open to introducing knitting as a kind of *queer use case* that scrutinises use and is a valuable practice of HRC. In this sense, it is a call for a different robotic culture, much more in line with, for instance, Simone Giertz' *Shitty Robots* and her playful intervention with robots, like the lipstick robot (2016) which is filmed as smearing lipstick onto her lips, but also onto her left cheek in a very impressive fashion, while she is reading something on her tablet.[4] This robot could all too easily be dismissed as a useless invention. However, I suggest staying with the quirkiness of seemingly useless machines, such as the lipstick robot or the knitting robot, in order to re-pose the question of *What's the use?* in opening up debates on human-robot relations of the future. It is precisely in this sense that robotic knitting views the robotic future as open and works towards opening it up for knitting.

Developing the notion of robotic knitting as a multi-faceted tool, this book is split into three parts: Chapter 1 will describe central aspects of the sociotechnical formation of the robotic imaginary, as well as the methodology and methods of engagement. The second part of the book, Chapter 2, explores the relation between handicraft and cobot technologies, illustrated by the case study of robotic knitting, with a focus on practices and practicalities of realising human-robot knitting as a collaborative task. The final and closing part, Chapter 3, will present the results of this project and tentatively discuss robotic knitting beyond the case study, and as a tool for non-determinist critique: to think about and imagine 'our' robotic futures, and to act with current and future robot technologies as open and in need of a re-crafting.

4 https://www.youtube.com/watch?v=WcW70-6eQcY



CHAPTER 1
THE KNITTER IN THE LAB: BECOMING SAND IN THE GEARBOX