# PROPOSED Title/SUBTITLE

Building Intelligent Systems : A Guide to Machine Learning in Practice

# AuTHOR DATA

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# BOOK Description

This is a book about leveraging machine learning in practice.

It gives the reader everything they’ll need produce fully functioning Intelligent Systems, ones that leverage machine learning, and data from user interactions to improve over time and achieve success.

After reading this book the reader will be able to design and implement an intelligent system from end-to-end, including:

* Implementing an Intelligence across client, service, and back end
* Building intelligence at scale, and growing it over time
* Designing effective interactions between users and intelligence
* Operating an intelligence service over its lifecycle
* Targeting intelligence to achieve an organization’s goals

They’ll also understand how to best apply their existing skills in software engineering, data science, machine learning, or program management to the effort.

This book is based over a decade of experience building Internet scale intelligent systems. I hope this book helps accelerate the proliferation of systems that turn data into impact and helps readers develop practical skills in this important area.

# UNIQUE Selling Points

* There are many great books on data and machine learning skills. Those books are similar to books on programming languages, they teach valuable skills in great detail. This book is more similar to a book on software engineering, it teaches how to take the basic skills and produce a working system.
* This books is based on over a decade of experience building and running intelligence systems that have hundreds of millions of user interactions per day in some of the largest most important software systems in the world. This is the book I wish I’d had when I was getting started.
* This book does not assume a deep technical understanding of machine learning. It assumes basic computer science knowledge and explains everything a reader needs to participate in building an intelligent system.

# What READERS Will Learn?

* **Choose when to use an Intelligent System and how to set an effective Objective**
* **Connect Intelligence to User Experience and achieve the desired results**
* **Implement an Intelligence System, including everything it takes to go from idea to impact**
* **Create Intelligence to light up the system**
* **Operate the Intelligence System over its lifetime, dealing with all the pitfalls that occur**

# Key Words

* Machine Learning
* Machine Learning Engineering
* Applied Machine Learning
* Artificial Intelligence
* Big Data
* Intelligent Systems
* Internet Scale Intelligence
* Intelligent Experience
* Active Intelligence
* Data Mining

# Audience

This book is for anyone with a computer science degree who wants to understand what it takes to build effective Intelligence Systems.

Imagine a typical software engineer who gets assigned to a machine learning project. They want to learn more about it so they pick up a book, and it is technical, full of statistics and math and modeling methods. These are important skills, but they are the wrong information to help the software engineer contribute to the effort. This is the right book for them.

Imagine a machine learning practitioner who needs to understand how the end-to-end system will interact with the models they produce, what they can count on and what they need to look out for in practice. This is the right book for them.

Imagine a technical manager who wants to begin benefiting from machine learning. Maybe they hire a machine learning PhD and let them work for a while. The machine learning practitioner comes back with charts, precision/recall curves, and training data requests, but no framework for how they should be applied. This is the right book for them.

# Competition

[http://www.amazon.com/Data-Science-Business-Data-Analytic-Thinking/dp/1449361323/ref=sr\_1\_1?ie=UTF8&qid=1464379299&sr=8-1&keywords=foster+data+science](http://www.amazon.com/Data-Science-Business-Data-Analytic-Thinking/dp/1449361323/ref%3Dsr_1_1?ie=UTF8&qid=1464379299&sr=8-1&keywords=foster+data+science) is a good book in the general area. It provides much more focus on the data science skill set and would be an excellent reference for readers of the book we are proposing.

[http://www.amazon.com/Data-Smart-Science-Transform-Information/dp/111866146X/ref=pd\_bxgy\_14\_img\_3?ie=UTF8&refRID=0QJ3CZPXAZF75N0A587D](http://www.amazon.com/Data-Smart-Science-Transform-Information/dp/111866146X/ref%3Dpd_bxgy_14_img_3?ie=UTF8&refRID=0QJ3CZPXAZF75N0A587D) is another good book that teaches the basic skills of data science.

These are the types of books that teach basic data skills. These skills are important, but aren’t sufficient to build intelligent systems in practice.

# ESTIMATED Page/WORD Count

80,000 – 100,000 words. Maybe 400 pages.

# ESTIMATED Schedule

The books is currently one half complete in draft format.

Estimate 3-4 months to a complete draft.

# Author Bio/CV

Geoff Hulten: In my career at Microsoft I've been called a Researcher, an Applied Researcher, an Applied Research Manager, a Program Manager, an Architect, a Software Development Engineer, and Machine Learning Scientist. Through all of this I've worked on a dozen Internet-scale Intelligence Systems that have hundreds of millions of interactions with users every day in Windows, Edge/Internet Explorer, Outlook, and Xbox. I am an inventor on 26 issued patents. And my research has appeared in top international machine learning conferences, received thousands of citations, and won a SIGKDD Test of Time award for influential contributions to the data mining research community that have stood the test of time.

I also write fiction and have developed award winning games for the Palm Pilot.

# AUTHOR Platform

<https://www.linkedin.com/in/geoff-hulten-58136a1/> I have ~200 connections including many top machine learning practitioners.

<https://www.facebook.com/ghulten>

# Table of Contents

The book is divided into five parts, each containing five to six chapters. Each chapter averages 3,000 words (12 – 18 pages).

***Building Intelligent Systems:***

***A Guide to Machine Learning in Practice***

**Introduction**

After reading this chapter the reader should:

* Be able to identify Intelligent Systems in the world around them.
* See the potential that Intelligent Systems can unlock.
* Understand the relationship between Machine Learning and Intelligent Systems.

The reader should be able to answer questions like:

* What services do you use that (you suspect) are built by turning customer data into customer experience?
* What is the most magical experience you’ve had with one of these services?
* What is the worst experience you’ve had?

 **What is an Intelligent System**

 **An Example Intelligent System**

 **From Machine Learning to Machine Learning Engineering**

 **About this Book**

 **Who This Book Is For**

 **For Thought...**

**Part I Approaching an Intelligent System Project**

 **Introduction**

This part sets the groundwork for a successful Intelligent Systems project. It describes what Intelligent Systems are, and what they are good for. It refreshes some important background. It explains how to ensure the Intelligent System has a useful, achievable goal. And it gives an overview of what to expect when taking on an Intelligent System implementation project.

 **Chapter 1 Knowing When to Use Intelligent Systems**

After reading this chapter the reader should:

* Be able to tell if their problem would benefit from an Intelligent System or not.

The reader should be able to answer questions like:

* What is your favorite hobby that would benefit from an Intelligent System?
* What is an example of a common activity you do every day where an Intelligent System might not be right? Why?

 **Basic Requirements: What Every Intelligent System Needs**

 **What types of Problems need Intelligent Systems**

 **Knowing when to say No**

 **Checklist for Identifying If Intelligence is Right for You**

 **For Thought...**

 **Chapter 2 Understanding What it Takes to build an Intelligent System**

After reading this chapter the reader should:

* Be able to articulate all the conceptually hard things they will need to address to build a successful Intelligent System.
* Understand how these hard things interact, some of the tradeoffs and ways they can support one another.

The reader should be able to answer questions like:

Consider the Intelligent System you interact with most.

* Can you guess what its creators track to know if it is achieving its objective or not?
* Can you identify how the user experience supports the intelligence?
* Can you identify any distinguishing elements of its implementation? Service? Client? Technologies?
* Can you find any information on how its intelligence is produced? Maybe in a news story or publication?
* Can you determine any of the ways it detects and mitigates intelligence mistakes?

 **An Achievable Objective**

 **A Link between Intelligence and Users**

 **An Implementation of The Intelligent System**

 **A Facility to Create and Improve Intelligence**

 **A Plan to Run the System and Deal With Problems**

 **Bringing it Together**

 **For Thought...**

 **Chapter 3 A Brief Refresher on Working with Data**

After reading this chapter the reader should:

* Understand the types of things data is used for.
* Have some intuition about how apply the things data can do.
* Have some intuition about how data can go wrong and lead to bad outcomes.

The reader should be able to answer questions like:

* What is the biggest mistake you know of that was probably made because someone misused data?

 **What is Data**

 **Structured Data**

 **Asking Simple Questions of Data**

 **Conceptual Machine Learning**

 **Working with Models of Data**

 **Common Pitfalls of Working with Data**

 **For Thought...**

 **Chapter 4 Defining the Intelligent System's Goal**

After reading this chapter the reader should:

* Understand the ways they can define success for an Intelligent System, and how to measure if success is being achieved.
* Be able to define success on several levels of abstraction and tell the story of how the different types of success contribute to each other.

The reader should be able to answer questions like:

Consider your favorite hobby that might benefit from an Intelligent System.

* What business objective would the intelligent system contribute to for its developers?
* What leading outcomes would make the most sense for it?
* What are the specific user outcomes that the Intelligent System would be tracked on?
* Which way would you measure these? Why?

 **Criteria for a Good Goal**

 **An Example of why Choosing Goals is Hard**

 **Types of Goals**

 **Layering Goals**

 **Ways to Measure Goals**

 **Keeping Goals Healthy**

 **For Thought...**

 **Chapter 5 The Lifecycle of an Intelligent System**

After reading this chapter the reader should:

* Understand the process required to go from an idea to a fully functional Intelligent System.
* Know how to plan for the various phases of an Intelligent System, from implementation to operation, what is required to succeed, and when it’s time to progress.

The reader should be able to answer questions like:

Consider an Intelligent System you interact with on a regular basis.

* How many people do you think are working on creating intelligence for it?
* When do you think they’ll be done?

 **Tell the Success Story**

 **Common Starting Points**

 **The Phases of an Intelligent System**

 **Knowing when you are Done**

 **For Thought...**

**Part II Intelligent Experiences**

 **Introduction**

This part explains how to connect Intelligence with users to achieve the system’s objectives. It discusses the pitfalls and challenges of creating user experiences based on Intelligence, along with the properties of a successful Intelligent Experience. It explains how to adapt experiences to get data to grow the system. And it gives a framework for verifying that an Intelligent Experience is behaving as intended.

 **Chapter 6 The Components of Intelligent Experiences**

After reading this chapter the reader should:

* Understand how user experience and intelligence come together to produce desirable user impact.
* Know common approaches to creating intelligent experiences.

The reader should be able to answer questions like:

* Find example of all the types of intelligent experiences in systems you interact with regularly (Automation, Prompting, Organizing, Informing, and Indirect Optimization (that one might be hard)).

 Consider the intelligent experience you interact with most.

* What type of experience is it?
* Re-imagine it in another type.

 **Closing the Loop Between Intelligence and Users**

 **The Role of Experience**

 **When Experience is Not Needed**

 **Types of Intelligent Experiences**

 **For Thought...**

 **Chapter 7 Why Creating Intelligence Experiences is Hard**

After reading this chapter the reader should:

* Understand the fundamental challenges that intelligent experiences need to address to make intelligence shine.
* Realize why these challenges are not intelligence bugs (which should be fixed) but are intrinsic to working with intelligence (and must be embraced).

The reader should be able to answer questions like:

* What is the worst mistake you’ve seen an intelligent system make?
* What could an intelligent experience have done to make the mistake less bad?

 **Intelligence is Not Perfect**

 **Intelligence Makes Mistakes**

 **Intelligence Makes Crazy Mistakes**

 **Intelligence Makes Different Types of Mistakes**

 **Intelligence Changes**

 **For Thought...**

 **Chapter 8 Achieving Successful Intelligent Experiences**

After reading this chapter the reader should:

* Know the factors that must be balanced to create an effective intelligent experience: one that is pleasant to use, is effective and mitigates mistakes, one that works with intelligence in a service, and one that evolves as intelligence does.

The reader should be able to answer questions like:

* What is the creepiest, most irritating intelligent experience you’ve interacted with?
* What could have changed to make it better, while still achieving the system’s goals?

Consider your favorite intelligence service.

* How does its experience allow you to identify it made a mistake? And how can you recover when it does?

 **Elements of a Successful Intelligent Experience**

 **The Human Factor**

 **Being Right and Wrong**

 **An Example: Breaktime**

 **Experience Lifecycles**

 **Service based Intelligence**

 **For Thought...**

 **Chapter 9 Getting Data from Experience**

After reading this chapter a reader should:

* Know how to craft experiences that collect the data needed to evaluate and grow intelligence.
* Understand the options for collecting this data from users that range from ones requiring no explicit user action, to ones requiring extensive user involvement.

The reader should be able to answer questions like:

* Think of an intelligent service you use regularly that seems to collect all its data implicitly. How could it be changed to leverage user classifications?
* Imagine an intelligent system to assist your favorite hobby. Think of an implicit way to collect useful data when it does something wrong. Now think of another way to collect data in the same situation that expresses a different user interpretation of the mistake (e.g. maybe that the intelligence was correct, but the user didn’t want to do the suggested action for some other reason).

 **Types of Data to Get**

 **Properties of Good Data**

 **Ways to Get Data**

 **For Thought...**

 **Chapter 10 Verifying Intelligent Experiences**

After reading this chapter the reader should:

* Be able to isolate experience issues (from intelligence ones) and verify that the experience is working as intended on its own.
* Build an effective test plan for an intelligent experience.
* Understanding the importance of re-verifying as the intelligence and userbase change.

The reader should be able to answer questions like:

Consider an intelligent system you use regularly.

* Sketch a plan to verify that its experience is functioning correctly.
* Design a simple intelligence to help verify this experience. Describe three contexts you would manually create to execute this simple intelligence as part of verification. Why did you pick those three?
* What would you monitor to detect that the experience is losing effectiveness?

 **Properties of a Functioning Experience**

 **Separating Experience from Intelligence**

 **Getting Intended Experiences**

 **Achieving Goals**

 **Continual Verification**

 **For Thought...**

**Part III Implementing Intelligence**

 **Introduction**

This part discusses the implementation of Intelligent Systems. It covers all the important components that need to be built, their responsibilities, the options, and trade-offs. These are the systems that take intelligence (e.g. models produced by machine learning) and turn it into a fully functional system — executing the intelligence, moving it where it needs to be, combining it, monitoring it, supporting its creation. These systems enable the operation of Intelligent Systems throughout their life cycle, with confidence.

 **Chapter 11 The Components of an Intelligence Implementation**

After reading this chapter the reader should:

* Understand the work it takes to go from a piece of intelligence (e.g. a machine learned model) to a fully functional Intelligent System.
* Be able to name and describe the key components that make up an implementation of an Intelligent System.

The reader should be able to answer questions like:

Consider an activity you do daily.

* What would a minimalist implementation of an Intelligent System to support the activity look like?
* Which component — the runtime, the intelligence management, the telemetry, the intelligence creation environment, the operations — do you think would require the most investment? Why?

 **The Role of Intelligence Implementation**

 **An Example of Intelligence Implementation**

 **Components of an Intelligence Implementation**

 **For Thought...**

 **Chapter 12 The Intelligence Runtime**

After reading this chapter the reader should:

* Be able to design and implement a runtime that executes intelligence and uses it to power user experience.
* Understand how to structure an intelligence runtime to allows innovation in intelligence and supports the other components of the intelligence implementation.

The reader should be able to answer questions like:

* What is the difference between the context of an intelligence call and the features used by the machine learned model?

Consider the Intelligence System you used most recently.

* What type of information would be in the context of the intelligence calls it makes?
* At a high level, walk through the steps to go from that context to a user-impacting experience (invent any details you need to about how the system might work).
* What are some ways this system’s intelligence might be encapsulated to mitigate the effect small intelligence changes have on the user?

 **The Intelligence Call**

 **Components of an Intelligence Call**

 **The Intelligence API**

 **For Thought...**

 **Chapter 13 Where Intelligence Lives**

After reading this chapter the reader should:

* Know all the places intelligence can live, from client to the service back-end, and the pros and cons of each.
* Understand the implications of intelligence placement and be able to design an implementation that is best for their system.

The reader should be able to answer questions like:

* Imagine a system with a 1MB intelligence model, and 10KB of context for each intelligence call. If the model needs to be updated daily, at what number of users/intelligence call volume does it make sense to put the intelligence in a service vs in the client?
* If your application needs to work on an airplane over the Pacific ocean (with no Internet) what are the options for intelligence placement?
* What if your app needs to function on an airplane, but the primary use case is at a user’s home? What are some options to enable the system to shine in both settings?

 **Considerations for Positioning Intelligence**

 **Places to Put Intelligence**

 **For Thought...**

 **Chapter 14 Intelligence Management**

After reading this chapter the reader should:

* Be able to design and build a system to manage the intelligence in an Intelligent System.
* Know the ways intelligence might arrive into the system, and how to verify it.
* Understand the ways intelligence might be combined, and be prepared to design an intelligence combination strategy for their environment.
* Have access to a collection of ways to roll out intelligence changes safely, ensuring they are doing what they were intended to do.

The reader should be able to answer questions like:

Consider an Intelligence System to support your favorite hobby.

* What are some ways it might need to use multiple intelligence sources? What techniques would be best to combine them?
* How would the answer change if there were ten people working on creating the intelligence? If there were fifty?
* Design a system for managing intelligence for an Intelligence Service where the intelligence changes on a monthly basis. What tools would you build? What facilities would you create for rolling out the intelligence?

 **Introduction to Intelligence Management**

 **Intelligence Management Steps**

 **Lighting Up Intelligence**

 **Succeeding at Intelligence Management**

 **For Thought...**

 **Chapter 15 The Intelligence Telemetry Pipeline**

After reading this chapter the reader should:

* Understand how telemetry enables Intelligent Systems, making sure they are working, and allowing them to improve as they are used.
* Be able to design a telemetry system that meets the needs of their application, collecting the right data, and informing the right people about what it contains.

The reader should be able to answer questions like:

Consider an intelligent system that you think one of your friends would like to use.

* If it’s too expensive to collect all the possible telemetry, how would you limit the telemetry you do collect?
* What facilities would you need to drill in when there are specific problems?
* How much work would it be to make sure the system is functioning correctly day by day? What would you do to make it easier?

 **The Role of the Telemetry Pipeline**

 **Getting Training Data**

 **Building for Flexibility**

 **Types of Monitoring**

 **For Thought...**

**Part IV Creating Intelligence**

 **Introduction**

This part explores the ways intelligence is created. It will explain all the places intelligence might come from (including machine learning) and the pros and cons of each. It will explore goals of intelligence creation at various points in the Intelligent System’s lifecycle. It will provide insight on how to organize and control intelligence creation in team environments. And it will outline tools needed to help intelligence creation and verification in practice.

This is not a chapter on specific machine learning techniques, but rather on everything that supports those techniques (and other intelligence creation techniques), allowing them to be used to achieve success when developing large, complex Intelligent Systems.

 **Chapter 16 Defining Intelligence**

After reading this chapter the reader should:

* Be able to discuss all the different types of intelligences that might contribute to an Intelligence System, including their strengths and weaknesses.

The reader should be able to answer questions like:

* What are the conditions when human created intelligence has an advantage over machine learned intelligence?
* Among the intelligence systems you interact with find an example of intelligence that does classification, an example of regression, and an example of ranking.

 **How Intelligence Works**

 **Where Intelligence Comes From**

 **What Intelligence Does**

 **For Thought...**

 **Chapter 17 The Intelligence Creation Process**

After reading this chapter the reader should:

* Know how to build intelligence end-to-end, and know where to apply machine learning tools to help produce more sophisticated intelligences.
* Understand the properties of a mature intelligence creation process and how to set one up in their environment.

The reader should be able to answer questions like:

Pick any intelligence systems you find interesting.

* Describe the process of going from data to a functional intelligence for the chosen system.
* Discuss the criteria for deciding how much to invest in automating the intelligence creation process you described.

 **Data**

 **Feature Engineering**

 **Modeling**

 **Verifying**

 **Iterating**

 **Stages of Maturity**

 **For Thought...**

 **Chapter 18 Contexts for Intelligence Creation**

After reading this chapter the reader should:

* Be familiar with the three main contexts for creating intelligence: before the system is built, while building the system, and while running the system.
* Be able to design intelligence creation plans for each of the contexts.

The reader should be able to answer questions like:

Consider building the intelligence for an Intelligent System to support your favorite cause (charity, organization, etc).

* Discuss the prototype intelligence you would build while conceptualizing the system. What outcome of the prototype would lead you to advocate that the system move forward? What outcome would lead you to advocate that it be canceled?
* What level of intelligence would you need to reach before allowing real users onto the system?
* How far would you need to push the intelligence before putting it into a maintenance mode?

 **While Conceptualizing the System**

 **While Building the System**

 **Going Active**

 **For Thought...**

 **Chapter 19 Organizing Intelligence**

After reading this chapter the reader should:

* Understand what it takes to work on a large, complex intelligence system, or with a team of intelligence creators.
* Be able to implement an intelligence architecture that allows the right intelligence to attack the right parts of their problem, and all participants to work together efficiently.

The reader should be able to answer questions like:

* Describe an Intelligent System that does not need to have any intelligence organization — that is, it works with just a single model.
* What are some of the ways this might cause problems? What problems are most likely to occur?
* Design a simple intelligence organization plan that addresses the most likely problem.

 **Reasons to Organize Intelligence**

 **Ways to Organize Intelligence**

 **Properties of a Well Organized Intelligence**

 **For Thought...**

 **Chapter 20 The Intelligence Creation Environment**

After reading this chapter the reader should:

* Be able to describe what tools are needed to produce an intelligence that will work in practice (and not just in the lab).
* Be able to design a system to take over model production from humans once the creation process has become reasonably routine.
* Understand the costs and challenges of working with large collections of user generated data.

The reader should be able to answer questions like:

* Describe at least three ways (not mentioned in the chapter) why a model might give different answers in production from the ones it gives in the lab.
* Pick one of them and sketch a system design that would mitigate it (including tools in the intelligence creation environment and client or telemetry changes).
* When details about the user are in the system, describe a situation where they should not be used to help improve the quality of the intelligence.
* Describe a situation where they could be.

 **Role of Intelligence Creation Environment**

 **Properties of an Excellent Creation Environment**

 **Planning for Data Scale**

 **Preserving Privacy**

 **For Thought...**

 **Chapter 21 Verifying Intelligence**

After reading this chapter the reader should:

* Be able to design and implement an intelligence verification system.
* Understand that the distribution of mistakes an intelligence makes can be just as damaging as the number of mistakes.
* Know how to verify intelligence offline (in the lab) and online (against real usage) and the pros and cons of the approaches.

The reader should be able to answer questions like:

* Describe a situation (that wasn’t mentioned in the chapter) where offline verification is particularly misleading.
* Sketch an online verification plan to address the weaknesses.

 **Goals of Intelligence Verification**

 **Offline Verification**

 **Online Verification**

 **For Thought...**

**Part V Operating Intelligent Systems**

 **Introduction**

This part discusses what it takes to run an Intelligence System. This includes taking control of all the parts of it, tuning it, growing it, debugging it, and ensuring that it is constantly achieving its goals.

It discusses the tools needed. How to know when there are mistakes, and what to do. How to evolve the system while bringing users along. And what to do if people start to abuse your system.

 **Chapter 22 The Intelligence Operator**

After reading this chapter the reader should:

* Understand what it takes to run an intelligence system, including making sure it is achieving its goal and its mistakes don’t get out of hand.
* Be able to step back and see how the tools created in earlier parts of the book can be used together to achieve success, dynamically over time.

The reader should be able to answer questions like:

* Imagine a system’s intelligence begins to behave poorly. What non-intelligence-based changes could be made to mitigate the issue?
* Pick two of your favorite Intelligence Systems. Which would be harder to operate? Why?

 **Driving the Racecar**

 **Owning the KPI**

 **Keeping Intelligence Service Healthy**

 **Phases of Operation**

 **For Thought...**

 **Chapter 23 The Intelligence Operation Environment**

After reading this chapter the reader should:

* Know the common tools needed to keep an Intelligence Service healthy.
* Be able to design and build these tools.

The reader should be able to answer questions like:

Imagine an important intelligence service.

* Under what circumstances would you recommend it be shut down?
* Design an experience change that an operator could deploy quickly enough to allow the service to continue.

 **Inspect Interactions**

 **Creating Intelligence**

 **Tuning Intelligence**

 **Override Decisions**

 **Disable Intelligence**

 **Query Telemetry**

 **Shutting Down Gracefully**

 **For Thought...**

 **Chapter 24 Dealing with Mistakes**

After reading this chapter the reader should:

* Understand when and how mistakes put an Intelligence System at risk.
* Be able to design a system to find, track, and respond to the mistakes an Intelligence System makes.

The reader should be able to answer questions like:

* What is the most widespread Intelligence System mistake you are aware of?
* What is the most expensive one?
* Design a system to address one of these.
* Would it work for the other? Why or why not?

 **The Cost of a Mistake**

 **Creating a Support Tier**

 **Knowing when a Mistake is a Problem**

 **For Thought...**

 **Chapter 25 Evolving Intelligence Safely**

After reading this chapter the reader should:

* Know how to balance the benefit of change with the cost of change.
* Understand how to manage the process of change in their own Intelligent System.

The reader should be able to answer questions like:

* What is the most poorly handled software change you are aware of?
* What software change irritated you at first, but, once you got used to it, you ended up liking it?
* What are three ways (not listed in the chapter) that an intelligence could change for the better, but make your interactions with the Intelligent Experience worse (at least for a while)?

 **Non-Stationary Distributions and Machine Learning**

 **Reasons to Change**

 **Determining if the change is worth the Cost**

 **A Kinect Example**

 **Ways to Evolve**

 **For Thought...**

 **Chapter 26 Adversaries and Abuse**

After reading this chapter the reader should:

* Know what abusers are and what they do.
* Be able to identify easy changes that will make their Intelligence System much less interesting to abusers.

The reader should be able to answer questions like:

Consider your favorite Intelligence System.

* What is one simple change that would make it much more interesting to abusers?
* What is one simple change to make it less interesting to abusers?

 **Primer on Internet Abuse**

 **Estimating your Risk**

 **What an Abuse Problem Looks Like**

 **Ways to Combat Abuse**

 **For Thought...**

 **The Road Ahead**

 **Progressing with Confidence**

 **An Intelligence Culture**

 **Building the Team**

 **Advocating for Intelligence in your Organization**

AT A GLANCE

***Building Intelligent Systems:***

***A Guide to Machine Learning in Practice***

**Introduction**

 **What is an Intelligent System**

 **An Example Intelligent System**

 **From Machine Learning to Machine Learning Engineering**

 **About this Book**

 **Who This Book Is For**

 **For Thought...**

**Part I Approaching an Intelligent System Project**

 **Chapter 1 Knowing When to Use Intelligent Systems**

 **Basic Requirements: What Every Intelligent System Needs**

 **What types of Problems need Intelligent Systems**

 **Knowing when to say No**

 **Checklist for Identifying If Intelligence is Right for You**

 **For Thought...**

 **Chapter 2 Understanding What it Takes to build an Intelligent System**

 **An Achievable Objective**

 **A Link between Intelligence and Users**

 **An Implementation of The Intelligent System**

 **A Facility to Create and Improve Intelligence**

 **A Plan to Run the System and Deal With Problems**

 **Bringing it Together**

 **For Thought...**

 **Chapter 3 A Brief Refresher on Working with Data**

 **What is Data**

 **Structured Data**

 **Asking Simple Questions of Data**

 **Conceptual Machine Learning**

 **Working with Models of Data**

 **Common Pitfalls of Working with Data**

 **For Thought...**

 **Chapter 4 Defining the Intelligent System's Goal**

 **Criteria for a Good Goal**

 **An Example of why Choosing Goals is Hard**

 **Types of Goals**

 **Layering Goals**

 **Ways to Measure Goals**

 **Keeping Goals Healthy**

 **For Thought...**

 **Chapter 5 The Lifecycle of an Intelligent System**

 **Tell the Success Story**

 **Common Starting Points**

 **The Phases of an Intelligent System**

 **Knowing when you are Done**

 **For Thought...**

**Part II Intelligent Experiences**

 **Chapter 6 The Components of Intelligent Experiences**

 **Closing the Loop Between Intelligence and Users**

 **The Role of Experience**

 **When Experience is Not Needed**

 **Types of Intelligent Experiences**

 **For Thought...**

 **Chapter 7 Why Creating Intelligence Experiences is Hard**

 **Intelligence is Not Perfect**

 **Intelligence Makes Mistakes**

 **Intelligence Makes Crazy Mistakes**

 **Intelligence Makes Different Types of Mistakes**

 **Intelligence Changes**

 **For Thought...**

 **Chapter 8 Achieving Successful Intelligent Experiences**

 **Elements of a Successful Intelligent Experience**

 **The Human Factor**

 **Being Right and Wrong**

 **An Example: Breaktime**

 **Experience Lifecycles**

 **Service based Intelligence**

 **For Thought...**

 **Chapter 9 Getting Data from Experience**

 **Types of Data to Get**

 **Properties of Good Data**

 **Ways to Get Data**

 **For Thought...**

 **Chapter 10 Verifying Intelligent Experiences**

 **Properties of a Functioning Experience**

 **Separating Experience from Intelligence**

 **Getting Intended Experiences**

 **Achieving Goals**

 **Continual Verification**

 **For Thought...**

**Part III Implementing Intelligence**

 **Chapter 11 The Components of an Intelligence Implementation**

 **The Role of Intelligence Implementation**

 **An Example of Intelligence Implementation**

 **Components of an Intelligence Implementation**

 **For Thought...**

 **Chapter 12 The Intelligence Runtime**

 **The Intelligence Call**

 **Components of an Intelligence Call**

 **The Intelligence API**

 **For Thought...**

 **Chapter 13 Where Intelligence Lives**

 **Considerations for Positioning Intelligence**

 **Places to Put Intelligence**

 **For Thought...**

 **Chapter 14 Intelligence Management**

 **Introduction to Intelligence Management**

 **Intelligence Management Steps**

 **Lighting Up Intelligence**

 **Succeeding at Intelligence Management**

 **For Thought...**

 **Chapter 15 The Intelligence Telemetry Pipeline**

 **The Role of the Telemetry Pipeline**

 **Getting Training Data**

 **Building for Flexibility**

 **Types of Monitoring**

 **For Thought...**

**Part IV Creating Intelligence**

 **Chapter 16 Defining Intelligence**

 **How Intelligence Works**

 **Where Intelligence Comes From**

 **What Intelligence Does**

 **For Thought...**

 **Chapter 17 The Intelligence Creation Process**

 **Data**

 **Feature Engineering**

 **Modeling**

 **Verifying**

 **Iterating**

 **Stages of Maturity**

 **For Thought...**

 **Chapter 18 Contexts for Intelligence Creation**

 **While Conceptualizing the System**

 **While Building the System**

 **Going Active**

 **For Thought...**

 **Chapter 19 Organizing Intelligence**

 **Reasons to Organize Intelligence**

 **Ways to Organize Intelligence**

 **Properties of a Well Organized Intelligence**

 **For Thought...**

 **Chapter 20 The Intelligence Creation Environment**

 **Role of Intelligence Creation Environment**

 **Properties of an Excellent Creation Environment**

 **Planning for Data Scale**

 **Preserving Privacy**

 **For Thought...**

 **Chapter 21 Verifying Intelligence**

 **Goals of Intelligence Verification**

 **Offline Verification**

 **Online Verification**

 **For Thought...**

**Part V Operating Intelligent Systems**

 **Chapter 22 The Intelligence Operator**

 **Driving the Racecar**

 **Owning the KPI**

 **Keeping Intelligence Service Healthy**

 **Phases of Operation**

 **For Thought...**

 **Chapter 23 The Intelligence Operation Environment**

 **Inspect Interactions**

 **Creating Intelligence**

 **Tuning Intelligence**

 **Override Decisions**

 **Disable Intelligence**

 **Query Telemetry**

 **Shutting Down Gracefully**

 **For Thought...**

 **Chapter 24 Dealing with Mistakes**

 **The Cost of a Mistake**

 **Creating a Support Tier**

 **Knowing when a Mistake is a Problem**

 **For Thought...**

 **Chapter 25 Evolving Intelligence Safely**

 **Non-Stationary Distributions and Machine Learning**

 **Reasons to Change**

 **Determining if the change is worth the Cost**

 **A Kinect Example**

 **Ways to Evolve**

 **For Thought...**

 **Chapter 26 Adversaries and Abuse**

 **Primer on Internet Abuse**

 **Estimating your Risk**

 **What an Abuse Problem Looks Like**

 **Ways to Combat Abuse**

 **For Thought...**

 **The Road Ahead**

 **Progressing with Confidence**

 **An Intelligence Culture**

 **Building the Team**

 **Advocating for Intelligence in your Organization**