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in deep learning,
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background, deep

learning techniques

used in industry, and
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perspectives.

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SpaceX Deep learning is a form of machine learning that enables computers to learn from experience and understand the world in terms of a hierarchy of concepts. Because the computer gathers knowledge from experience, there is no need for a human

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computer operator to formally specify all the knowledge that the computer needs. The hierarchy of concepts allows the computer to learn complicated concepts by building them out of simpler ones; a graph of these hierarchies would be many layers deep.

This book introduces

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a broad range of topics in deep learning. The text offers mathematical and conceptual background, covering relevant concepts in linear algebra, probability theory and information theory, numerical computation, and machine learning. It

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And Learning
Algorithmic
describes deep
learning techniques
used by practitioners
in industry, including
deep feedforward
networks,
regularization,
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algorithms,
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networks, sequence
modeling, and
practical
methodology; and it

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surveys such
applications as
natural language
processing, speech
recognition,
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systems,
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the book offers
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perspectives,

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covering such theoretical topics as linear factor models, autoencoders, representation learning, structured probabilistic models, Monte Carlo methods, the partition function, approximate inference, and deep generative models. Deep Learning can

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be used by

undergraduate or

graduate students

planning careers in

either industry or

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modern***

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data mining,
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recognition,
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neuroscience,
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cryptography. The
book introduces
theory in tandem**

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***with applications.
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is taught alongside
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systems such as
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for data
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codes for error-
correction.***

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including message-
passing***

***algorithms, Monte
Carlo methods and
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***approximations,
are developed
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clustering,
convolutional
codes,***

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component
analysis, and
neural networks.***

***Uniquely, the book
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codes, including lo
w-density-parity-
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areas as diverse
as computational
biology, financial
engineering and
machine learning.
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***contained
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causal inference,***

***increasingly
important in data
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***The
mathematization of
causality is a
relatively recent
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has become***

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self-contained and
concise
introduction to
causal models and
how to learn them
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***models and
discussing some
of the principles
underlying causal
inference, the
book teaches
readers how to use
causal models:
how to compute
intervention
distributions, how
to infer causal
models from***

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***observational and
interventional
data, and how
causal ideas could
be exploited for
classical machine
learning problems.
All of these topics
are discussed first
in terms of two
variables and then
in the more
general***

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multivariate case.

The bivariate case turns out to be a particularly hard problem for causal learning because there are no conditional independences as used by classical methods for solving multivariate cases.

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fundamentals of
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it was specifically
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the data
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section requires
no prior**

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***knowledge of
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***The treatment of
information theory,
while theoretical
and abstract, is
quite elementary,
making this text
less daunting than
many others. After
presenting the
fundamental
definitions and***

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**results of the
theory, the authors**

then apply the

theory to

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acquaint students

with a myriad of

lossless

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**compression
methods and then
introduce two**

**lossy compression
methods. Students
emerge from this
study competent
in a wide range of
techniques. The
authors'
presentation is
highly practical
but includes some**

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**important proofs,
either in the text or
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so instructors can,
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theoretical basis of
information theory***

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*that builds a firm,
intuitive grasp of
the subject*

*Reorganization of
theoretical results
along with new
exercises, ranging
from the routine to
the more difficult,
that reinforce
students' ability to
apply the
definitions and*

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**results in specific
situations.**

**Simplified
treatment of the
algorithm(s) of
Gallager and
Knuth Discussion
of the information
rate of a code and
the trade-off
between error
correction and
information rate**

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***Treatment of
probabilistic finite
state source
automata,
including basic
results, examples,
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exercises Octave
and MATLAB
image
compression
codes included in
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machines,
clustering, and
more. Color
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*world examples
are used to
illustrate the*

methods

presented. Since

the goal of this

textbook is to

facilitate the use of

these statistical

learning

techniques by

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**and other fields,
each chapter
contains a tutorial**

**on implementing
the analyses and
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**presented in R, an
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popular reference
book for statistics
and machine
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many of the same
topics, but at a*

*level accessible to
a much broader
audience. This
book is targeted at
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use cutting-edge
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techniques to*

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analyze their data.

***The text assumes
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regression and no
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matrix algebra.***

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random variables,
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the ground up, this
book is an ideal
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diamond norm and
its interpretation,
and a proof of the

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the quantum
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formula has been
completely revised,
and many new
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been added. This
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upcoming
generation of
quantum information
theorists and the
already established
community of
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the concept of

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information has
played a crucial role
in communication

theory, so much so
that the terms

information theory
and communication
theory are

sometimes used
almost

interchangeably. It
seems to us,

however, that the

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is an attempt to
illustrate some of

these uses of
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summarizes some

of his and his

associates' recent

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comments briefly on its philosophical suggestions.

Jamison surveys from the subjective point of view some recent results in 'Bayesian Information Usage'. Rosenkrantz analyzes the information obtained by experimentation

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from the Bayesian
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standpoints, and
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concepts. The much-
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problem of

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measuring the
information yield of
observations in his

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Pietarinen
addresses himself
to the more general
task of evaluating
the systematizing
(*'explanatory'*)

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power of
hypotheses and
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for error-
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toolbox of
inference
techniques,
including message-
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algorithms, Monte
Carlo methods, and
variational
approximations,
are developed
alongside**

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**applications of
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neural networks.**

**The final part of
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the state of the art
in error-correcting
codes, including
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filled with worked
examples and over
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the underlying
theory and
applications.**

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assist readers. The
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viewing the subject
in a wider context.*

*New results are
discussed, along
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biology. It contains
many exercises and
problems, and is
suitable for use as a
textbook on
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information is
necessary.*

A detailed and up-to-date introduction to machine learning, presented through the unifying lens of probabilistic modeling and Bayesian decision theory. This book offers a detailed and

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introduction to

machine learning

(including deep

learning) through

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probabilistic

modeling and

Bayesian decision

theory. The book

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mathematical

background

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*chapter exercises
allow students to
apply what they
have learned, and
an appendix covers
notation.*

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grew out of the
author's 2012 book,
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A Probabilistic
Perspective. More*

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*than just a simple
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completely new*

*book that reflects
the dramatic
developments in the
field since 2012,
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PyTorch, and
Tensorflow, which

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reproduce nearly all
the figures; this
code can be run
inside a web
browser using cloud-
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and provides a
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discussed in the
book. This*

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be followed by a
sequel that covers
more advanced
topics, taking the
same probabilistic
approach.*

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mathematical basis,
it merges key topics
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and quantum-
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such advanced
topics in quantum
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in the field of

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*particular, the
following topics – all
of which are*

*addressed here –
made seen major
advances: quantum
state discrimination,
quantum channel
capacity, bipartite
and multipartite
entanglement,
security analysis on
quantum*

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*communication,
reverse Shannon
theorem and*

uncertainty relation.

*With regard to the
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security, the present
book employs an
improved method
for the evaluation of
leaked information
and identifies a
remarkable relation*

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*between quantum
security and
quantum coherence.*

*Taken together,
these two
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transmission. In
addition, various
types of the newly
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are explained.

*Presenting a wealth
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*developments, the
book introduces
readers to the latest
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challenges in
quantum*

*information. To aid
in understanding,
each chapter is
accompanied by a*

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*set of exercises and
solutions.*

*During the past
decade there has
been an explosion
in computation and
information
technology. With it
have come vast
amounts of data in a
variety of fields such
as medicine,
biology, finance,*

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and marketing. The challenge of understanding these data has led to the development of new tools in the field of statistics, and spawned new areas such as data mining, machine learning, and bioinformatics.

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have common underpinnings but are often expressed with different terminology. This book describes the important ideas in these areas in a common conceptual framework. While the approach is statistical, the emphasis is on

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concepts rather than mathematics. Many examples are given, with a liberal use of color graphics. It should be a valuable resource for statisticians and anyone interested in data mining in science or industry. The book's coverage is broad,

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from supervised learning (prediction) to unsupervised learning. The many topics include neural networks, support vector machines, classification trees and boosting---the first comprehensive treatment of this topic in any book.

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*edition features
many topics not
covered in the*

*original, including
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random forests,
ensemble methods,
least angle
regression & path
algorithms for the
lasso, non-negative
matrix factorization,
and spectral*

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clustering. There is also a chapter on methods for “wide” data (p bigger than n), including multiple testing and false discovery rates.

*Trevor Hastie,
Robert Tibshirani,
and Jerome
Friedman are
professors of
statistics at Stanford*

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University. They are prominent researchers in this area: Hastie and Tibshirani developed generalized additive models and wrote a popular book of that title. Hastie co-developed much of the statistical modeling software

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*and environment in
R/S-PLUS and
invented principal*

*curves and
surfaces. Tibshirani
proposed the lasso
and is co-author of
the very successful
An Introduction to
the Bootstrap.*

*Friedman is the co-
inventor of many
data-mining tools*

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Science is
fundamentally
about learning
from data, and
doing so in the

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presence of
uncertainty.

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This volume is
an introduction
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statistics, and
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data. It describes the Bayesian

approach, and explains how this can be used to fit and compare models in a range of problems.

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estimation,
model

assessment, and
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methods, as
well as widely
used classical
methods such as
regularization
and hypothesis
testing. The
emphasis

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throughout is
on the
principles, the
unifying
probabilistic
approach, and
showing how the
methods can be
implemented in
practice. R
code (with
explanations)
is included and

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is available
online, so
readers can

reproduce the
plots and
results for
themselves.

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at

undergraduate
and graduate
students, these
techniques can

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be applied to a wide range of data analysis problems beyond the scope of this work.

The fundamental mathematical tools needed to understand machine learning include linear

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algebra,
analytic
geometry,
matrix

decompositions,
vector

calculus,
optimization,
probability and
statistics.

These topics
are

traditionally

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taught in
disparate
courses, making
it hard for
data science or
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students, or
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to efficiently
learn the
mathematics.

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prerequisites.
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which mostly
remain unsolved
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regions and the
like).

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such as 5/6G
cellular

communications,
Internet of
Things (IoT),
and mobile edge
networks, among
others, not
only require
reliable rates
of information
measured by the

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relevant
capacity and
capacity
regions, but
are also
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issues such as
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information,
priority of

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sharing of
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e), etc. This
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***an informant, or
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based approach,
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fields as natural
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