

Elements Parametric Design Robert Woodbury

Computer simulation experiments are essential to modern scientific discovery, whether that be in physics, chemistry, biology, epidemiology, ecology, engineering, etc. Surrogates are meta-models of computer simulations, used to solve mathematical models that are too intricate to be worked by hand. Gaussian process (GP) regression is a supremely flexible tool for the analysis of computer simulation experiments. This book presents an applied introduction to GP regression for modelling and optimization of computer simulation experiments. Features: • Emphasis on methods, applications, and reproducibility. • R code is integrated throughout for application of the methods. • Includes more than 200 full colour figures. • Includes many exercises to supplement understanding, with separate solutions available from the author. • Supported by a website with full code available to reproduce all methods and examples. The book is primarily designed as a textbook for postgraduate students studying GP regression from mathematics, statistics, computer science, and engineering. Given the breadth of examples, it could also be used by researchers from these fields, as well as from economics, life science, social science, etc.

Research in and on architecture is as complex as the discipline itself with its different specialist fields, and therefore the results often remain unconnected. Research Culture in Architecture combines digital and analog research issues and demonstrates how important cross-disciplinary cooperation in architecture is today. The complexity and increasing specialization are elaborated on in the various chapters and then linked to the core of architecture, i.e. design. Scientists from the theoretical and practical fields present research results in the following subjects: "design methodology", "architectural space, perception, and the human body", "analog and digital timber construction", "visualization", "robotics", "architectural practice and research", and "sustainability".

A rigorous yet accessible graduate textbook covering both fundamental and advanced optimization theory and algorithms.

"Computational Design Thinking, " AD Reader Edited by Achim Menges and Sean Ahlquist
The current transition from Computer Aided Design (CAD) to Computational Design in architecture represents a profound shift in design thinking and methods. Representation is being replaced by simulation, and the crafting of objects is moving towards the generation of integrated systems through designer-authored computational processes. While there is a particular history of such an approach in architecture, its relative newness requires the continued progression of novel modes of design thinking for the architect of the 21st century. This AD Reader establishes a foundation for such thinking. It includes multifaceted reflections and speculations on the profound influence of computational paradigms on architecture. It presents relevant principles from the domains of mathematics and computer science, developmental and evolutionary biology, system science and philosophy, establishing a discourse for computational design thinking in architecture. Rather than a merely technical approach, the book will discuss essential intellectual concepts that are fundamental not only for a discourse on computational design but also for its practice. This anthology provides a unique collection of seminal texts by authors, who have either provided a significant starting point through which a computational approach to design has been pursued or have played a considerable role in shaping the field. An important aspect of this book is the manner in which adjacent fields and historical texts are connected. Both the source of original inspiration and scientific thought are presented alongside contemporary writings on the continually evolving computational design discourse. Emerging from the field of science, principally the subjects of morphogenesis, evolution and mathematics, selected texts provide a historical basis for a reconfigured mindset of processes that generate, arrange and describe form. Juxtaposed against more contemporary statements regarding the influence of computation on design

thinking, the book offers advancements of fundamental texts to the particular purpose of establishing novel thought processes for architecture, theoretically and practically. The first reader to provide an effective framework for computational thinking in design. Includes classic texts by Johan W. von Goethe, D'Arcy Thompson, Ernst Mayr, Ludwig von Bertalanffy, Gordon Pask, Christopher Alexander, John H. Holland, Nicholas Negroponte, William Mitchell, Peter J. Bentley & David W. Corne, Sanford Kwinter, John Frazer, Kostis Terzidis, Michael Weinstock and Achim Menges Features new writing by: Mark Burry, Jane Burry, Manuel DeLanda and Peter Trummer.

Computational design has become widely accepted into mainstream architecture, but this is the first book to advocate applying it to create adaptable masterplans for rapid urban growth, urban heterogeneity, through computational urbanism. Practitioners and researchers here discuss ideas from the fields of architecture, urbanism, the natural sciences, computer science, economics, and mathematics to find solutions for managing urban change in Asia and developing countries throughout the world. Divided into four parts (historical and theoretical background, our current situation, methodologies, and prototypical practices), the book includes a series of essays, interviews, built case studies, and original research to accompany chapters written by editor Tom Verebes to give you the most comprehensive overview of this approach. Essays by Marina Lathouri, Jorge Fiori, Jonathan Solomon, Patrik Schumacher, Peter Trummer, and David Jason Gerber. Interviews with Dana Cuff, Xu Wei Guo, Matthew Prior, Tom Barker, Su Yunsheng, and Brett Steele. Built case studies by Zaha Hadid Architects, James Corner Field Operations, XWG Studio, MAD, OCEAN Consultancy Network, Plasma Studio, Groundlab, Peter Trummer, Serie Architects, dotA, and Rocker-Lange Architects.

Cylinders, spheres and cubes are a small handful of shapes that can be defined by a single word. However, most shapes cannot be found in a dictionary. They belong to an alternative plastic world defined by trigonometry: a mathematical world where all shapes can be described under one systematic language and where any shape can transform into another. This visually striking guidebook clearly and systematically lays out the basic foundation for using these mathematical transformations as design tools. It is intended for architects, designers, and anyone with the curiosity to understand the link between shapes and the equations behind them.

The Advances in Architectural Geometry (AAG) symposia serve as a unique forum where developments in the design, analysis and fabrication of building geometry are presented. With participation of both academics and professionals, each symposium aims to gather and present practical work and theoretical research that responds to contemporary design challenges and expands the opportunities for architectural form. The fifth edition of the AAG symposia was hosted by the National Centre for Competence in Research Digital Fabrication at ETH Zurich, Switzerland, in September 2016. This book contains the proceedings from the AAG2016 conference and offers detailed insight into current and novel geometrical developments in architecture. The 22 diverse, peer-reviewed papers present cutting-edge innovations in the fields of mathematics, computer graphics, software design, structural engineering, and the design and construction of architecture.

Discover BIM: A better way to build better buildings Building Information Modeling (BIM) offers a novel approach to design, construction, and facility management in which a digital representation of the building product and process is used to facilitate the exchange and interoperability of information in digital format. BIM is beginning to change the way buildings look, the way they function, and the ways in which they are designed and built. The BIM Handbook, Third Edition provides an in-depth understanding of BIM technologies, the business and organizational issues associated with its implementation, and the profound advantages that effective use of BIM can provide to all members of a project team. Updates to this edition

include: Information on the ways in which professionals should use BIM to gain maximum value New topics such as collaborative working, national and major construction clients, BIM standards and guides A discussion on how various professional roles have expanded through the widespread use and the new avenues of BIM practices and services A wealth of new case studies that clearly illustrate exactly how BIM is applied in a wide variety of conditions Painting a colorful and thorough picture of the state of the art in building information modeling, the BIM Handbook, Third Edition guides readers to successful implementations, helping them to avoid needless frustration and costs and take full advantage of this paradigm-shifting approach to construct better buildings that consume fewer materials and require less time, labor, and capital resources.

Generative design, once known only to insiders as a revolutionary method of creating artwork, models, and animations with programmed algorithms, has in recent years become a popular tool for designers. By using simple languages such as JavaScript in p5.js, artists and makers can create everything from interactive typography and textiles to 3D-printed furniture to complex and elegant infographics. This updated volume gives a jump-start on coding strategies, with step-by-step tutorials for creating visual experiments that explore the possibilities of color, form, typography, and images. Generative Design includes a gallery of all-new artwork from a range of international designers—fine art projects as well as commercial ones for Nike, Monotype, Dolby Laboratories, the musician Bjork, and others.

"This book helps designers realize the potential of the parameter in their work. It combines the basic ideas of parametric systems with equally basic ideas from both geometry and computer programming. It uses design patterns as its main tool. A pattern is a generic solution to a shared problem. Using patterns to think and work will help designers master the new complexity imposed on them by parametric modeling. This book explains how to think, model and conceive complex parametric designs. Through design patterns and many examples, it shows designers how to lift their knowledge and skill out of the CAD toolbox into higher levels of design thinking and action."--Back cover.

This Fourth Edition introduces the latest theory and applications in optimization. It emphasizes constrained optimization, beginning with a substantial treatment of linear programming and then proceeding to convex analysis, network flows, integer programming, quadratic programming, and convex optimization. Readers will discover a host of practical business applications as well as non-business applications. Topics are clearly developed with many numerical examples worked out in detail. Specific examples and concrete algorithms precede more abstract topics. With its focus on solving practical problems, the book features free C programs to implement the major algorithms covered, including the two-phase simplex method, primal-dual simplex method, path-following interior-point method, and homogeneous self-dual methods. In addition, the author provides online JAVA applets that illustrate various pivot rules and variants of the simplex method, both for linear programming and for network flows. These C programs and JAVA tools can be found on the book's website. The website also includes new online instructional tools and exercises.

Holistic Mobile Game Development with Unity: An All-In-One Guide to Implementing Mechanics, Art Design and Programming for iOS and Android Games Master mobile game design and development in this all-in-one guide to creating iOS and Android games in the cutting-edge game engine, Unity. By using Penny de Byl's holistic

method, you will learn about the principles of art, design, and code and gain multidisciplinary skills needed to succeed in the independent mobile games industry. In addition, hands-on exercises will help you throughout the process from design to publication in the Apple App Store and Google Play Store. Over 70 practical step-by-step exercises recreating the game mechanics of contemporary mobile games, including Angry Birds, Temple Run, Year Walk, Minecraft, Curiosity Cube, Fruit Ninja, and more. Design principles, art, and programming in unison - the one-stop shop for indie developers requiring interdisciplinary skills in their small teams. An introduction to essential two- and three-dimensional mathematics, geometry and physics concepts. A portfolio of royalty free reusable game mechanics and assets. Accompanying website, www.holistic3d.com, features project source code, instructional videos, art assets, author blog, and teaching resources. Challenge questions and lesson plans are available online for an enhanced learning experience.

Codify: Parametric and Computational Design in Landscape Architecture provides a series of essays that explore what it means to use, modify and create computational tools in a contemporary design environment. Landscape architecture has a long history of innovation in the areas of computation and media, particularly in how the discipline represents, analyses, and constructs complex systems. This curated volume spans academic and professional projects to form a snapshot of digital practices that aim to show how computation is a tool that goes beyond methods of representation and media. The book is organized in four sections; syntax, perception, employ, and prospective. The essays are written by leading academics and professionals and the sections examine the role of computational tools in landscape architecture through case studies, historical accounts, theoretical arguments, and nascent propositions.

Building Product Models thoroughly presents the concepts, technology, and methods now used to work out what will become the building product model - a new, digital representation for architecture, civil engineering, and building construction. Organized into three sections (history, current tools and concepts, and existing efforts and research issues), this resource provides the field of building product modeling with a standard reference as well as a single, comprehensive text for university courses. Until now, all the efforts in building modeling have been reported in research journals and conference proceedings or been made available as draft standards on the Internet. Building Product Models is the only book available on this vital field, bringing together essential aspects of major efforts from the early 1970s to the present.

Content analysis is one of the most important but complex research methodologies in the social sciences. In this thoroughly updated Second Edition of The Content Analysis Guidebook, author Kimberly Neuendorf provides an accessible core text for upper-level undergraduates and graduate students across the social sciences. Comprising step-by-step instructions and practical advice, this text unravels the complicated aspects of content analysis.

The production of architecture, both intellectually and physically, is on the brink of a fundamental change. Computational design enables architects to integrate ever more multifaceted and complex design information, while the industrial logics of conventional building construction are eroding rapidly in a context of increasingly ubiquitous computer-controlled manufacturing and fabrication. A novel convergence of computation and materialisation is about to emerge, bringing the virtual process of

design and the physical realisation of architecture much closer together, more so than ever before. Computation provides a powerful agency for both informing the design process through specific material behaviour and characteristics, and in turn informing the organisation of matter and material across multiple scales based on feedback from the environment. Computational design and integrated materialisation processes allow for uncovering the inherent morphogenetic potential of materials and thus are opening up a largely uncharted field of possibilities for the way the built environment in the 21st century is conceived and produced. In order to effectively introduce and outline the enabling power of computational design along with its inherent relationship to a biological paradigm, this publication looks at formation and materialisation in nature, integrative computational design, and engineering and manufacturing integration. Architectural contributors include: Cristiano Cecatto, Neri Oxman, Skylar Tibbits and Michael Weinstock. A scientific perspective by Philip Ball and J Scott Turner. Features: Buro Happold's SMART group, DiniTech, Foster + Partners' Specialist Modelling Group, the Freeform Construction group and Stuttgart University's Institute for Computational Design.

Smartgeometry (SG) is a key influence on the architectural community who explore creative computational methods for the design of buildings. An informal international network of practitioners and researchers, the group meets annually to experiment with new technologies and collaborate to develop digital design techniques. When SG was founded in 2001 by London-based architects and friends Hugh Whitehead (Foster + Partners), J Parrish (AECOM) and Lars Hesselgren (PLP), there was little in the way of parametric tools for architecture. SG was founded to encourage the development, discussion and experimentation of digital design techniques driven by design intent rather than on construction specifications. SG calls for a re-consideration of the design process, where the creation of computational mechanisms become an integral part of designing – not a task done prior to or separate from the process. In the early years of the workshops this need for new ways of design thinking led to the development of Bentley's Generative Components software. In recent years, the ecology of these design environments has diversified to include multiple software platforms, as well as innovative fabrication techniques and interactive environments. SG has grown accordingly from a handful of experts to an international network of designers who are defining the future of design. Founded by digital pioneers, it creates the algorithmic designers of the future. Inside Smartgeometry can be seen as a retroactive manifesto for SG, examining and contextualising the work of the SG community: the digital spaces, prototypes and buildings designed using bespoke tools created in response to architectural ideas. From interactive crowd-sourcing tools to responsive agent-based systems to complex digitally fabricated structures, it explores more than a decade of advances that have been influential for architecture. Through 23 original texts including reflections by the founders, and key contributors such as Robert Aish, Martin Bechthold, Mark Burry, Chris Williams and Robert Woodbury, the book offers a critical state of the art of computational design for architecture. Many international design and engineering firms have participated in SG and the book includes chapters by practitioners from offices such as CASE, Design2Production, Foster + Partners, Grimshaw, Populous and SOM.

Over the last decade, 'parametricism' has been heralded as a new avant-garde in the

industries of architecture, urban design, and industrial design, regarded by many as the next grand style in the history of architecture, heir to postmodernism and deconstruction. From buildings to cities, the built environment is increasingly addressed, designed and constructed using digital software based on parametric scripting platforms which claim to be able to process complex physical and social modelling alike. As more and more digital tools are developed into an apparently infinite repertoire of socio-technical functions, critical questions concerning these cultural and technological shifts are often eclipsed by the seductive aesthetic and the alluring futuristic imaginary that parametric design tools and their architectural products and discourses represent. *The Politics of Parametricism* addresses these issues, offering a collection of new essays written by leading international thinkers in the fields of digital design, architecture, theory and technology. Exploring the social, political, ethical and philosophical issues at stake in the history, practice and processes of parametric architecture and urbanism, each chapter provides different vantage points to interrogate the challenges and opportunities presented by this latest mode of technological production.

"The handbook introduces the theoretical basis and the main parametric modeling techniques based on algorithms, showing Grasshopper's practical applications and its potentialities in architecture, design and fabrication."--P. [4] of cover.

This is the first textbook on pattern recognition to present the Bayesian viewpoint. The book presents approximate inference algorithms that permit fast approximate answers in situations where exact answers are not feasible. It uses graphical models to describe probability distributions when no other books apply graphical models to machine learning. No previous knowledge of pattern recognition or machine learning concepts is assumed. Familiarity with multivariate calculus and basic linear algebra is required, and some experience in the use of probabilities would be helpful though not essential as the book includes a self-contained introduction to basic probability theory.

Geometric Computation: Foundations for Design describes the mathematical and computational concepts that are central to the practical application of design computation in a manner tailored to the visual designer. Uniquely pairing key topics in code and geometry, this book develops the two key faculties required by designers that seek to integrate computation into their creative practice: an understanding of the structure of code in object-oriented programming, and a proficiency in the fundamental geometric constructs that underlie much of the computational media in visual design.

Digital And Parametric Architecture explores the development of the latest digital tools including advance modeling software and computer aided design in the production of architecture. It is a journey through the most fascinating projects, digitally designed and fabricated, during the second decade of the 21st century. The book highlights the use of these technologies to explore tectonic operations such as sectioning, folding, contouring, and tessellating. A wide variety of projects that range in scale and location offer an insight into the architecture of the future.

With scripting, computer programming becomes integral to the digital design process. It provides unique opportunities for innovation, enabling the designer to customise the software around their own predilections and modes of working. It liberates the designer by automating many routine aspects and repetitive activities of the design process, freeing-up the designer to spend more time on design thinking. Software that is

modified through scripting offers a range of speculations that are not possible using the software only as the manufacturers intended it to be used. There are also significant economic benefits to automating routines and coupling them with emerging digital fabrication technologies, as time is saved at the front-end and new file-to-factory protocols can be taken advantage of. Most significantly perhaps, scripting as a computing program overlay enables the tool user (designer) to become the new tool maker (software engineer). Though scripting is not new to design, it is only recently that it has started to be regarded as integral to the designer's skill set rather than a technical speciality. Many designers are now aware of its potential, but remain hesitant. This book treats scripting not only as a technical challenge, requiring clear description, guidance and training, but also, and more crucially, answers the question as to why designers should script in the first place, and what the cultural and theoretical implications are. This book: Investigates the application of scripting for productivity, experimentation and design speculation. Offers detailed exploration of the scripting of Gaudí's final realised design for the Sagrada Família, leading to file-to-factory digital fabrication. Features projects and commentary from over 30 contemporary scripting leaders, including Evan Douglass, Marc Fornes, Sawako Kaijima, Achim Menges, Neri Oxman, Casey Reas and Hugh Whitehead of Foster + Partners.

A comprehensive and self-contained introduction to Gaussian processes, which provide a principled, practical, probabilistic approach to learning in kernel machines. Gaussian processes (GPs) provide a principled, practical, probabilistic approach to learning in kernel machines. GPs have received increased attention in the machine-learning community over the past decade, and this book provides a long-needed systematic and unified treatment of theoretical and practical aspects of GPs in machine learning. The treatment is comprehensive and self-contained, targeted at researchers and students in machine learning and applied statistics. The book deals with the supervised-learning problem for both regression and classification, and includes detailed algorithms. A wide variety of covariance (kernel) functions are presented and their properties discussed. Model selection is discussed both from a Bayesian and a classical perspective. Many connections to other well-known techniques from machine learning and statistics are discussed, including support-vector machines, neural networks, splines, regularization networks, relevance vector machines and others. Theoretical issues including learning curves and the PAC-Bayesian framework are treated, and several approximation methods for learning with large datasets are discussed. The book contains illustrative examples and exercises, and code and datasets are available on the Web. Appendixes provide mathematical background and a discussion of Gaussian Markov processes. Looks at the design and mathematical principles for over ninety pasta shapes through a classification tree based on physical characteristics and profiles that include descriptions, photographs, formulas, and cooking times for each pasta shape.

Beginning with a tutorial on customer-centered Web site design, this updated manual features a comprehensive compendium of ninety Web site design patterns, organized by color-coded pages for quick reference, with new sections on Web Application design, the Mobile Web, and Online Communities, as well as updated coverage of blog sites, customer support sites, and intranet design.

Original. (Intermediate)

"The BIM Handbook is an extensively researched and meticulously written book, showing evidence of years of work rather than something that has been quickly put together in the course of a few months. It brings together most of the current information about BIM, its history, as well as its potential future in one convenient place, and can serve as a handy reference book on BIM for anyone who is involved in the design, construction, and operation of buildings and needs to know about the technologies that support it. The need for such a book is indisputable, and it is terrific that Chuck Eastman and his team were able to step up to the plate and make it happen. Thanks to their efforts, anyone in the AEC industry looking for a deeper understanding of BIM now knows exactly where to look for it." —AECbytes book review, August 28, 2008

(www.aecbytes.com/review/2008/BIMHandbook.html) **DISCOVER BIM: A BETTER WAY TO BUILD BETTER BUILDINGS** Building Information Modeling (BIM) offers a novel approach to design, construction, and facility management in which a digital representation of the building process is used to facilitate the exchange and interoperability of information in digital format. BIM is beginning to change the way buildings look, the way they function, and the ways in which they are designed and built. The BIM Handbook, Second Edition provides an in-depth understanding of BIM technologies, the business and organizational issues associated with its implementation, and the profound advantages that effective use of BIM can provide to all members of a project team. Updates to this edition include: Completely updated material covering the current practice and technology in this fast-moving field Expanded coverage of lean construction and its use of BIM, with special focus on Integrated Project Delivery throughout the book New insight on the ways BIM facilitates sustainable building New information on interoperability schemas and collaboration tools Six new case studies Painting a colorful and thorough picture of the state of the art in building information modeling, the BIM Handbook, Second Edition guides readers to successful implementations, helping them to avoid needless frustration and costs and take full advantage of this paradigm-shifting approach to construct better buildings that consume fewer materials and require less time, labor, and capital resources.

Architects use CAD to help them visualize their ideas. Parametric design is a fast-growing development of CAD that lets architects and designers specify the key parameters of their model and make changes interactively. Whenever changes are made the rest of the model updates automatically. Through a detailed description of various parametric, generative and algorithmic techniques, this book provides a practical guide to generating geometric and topological solutions for various situations, including explicit step-by-step tutorials. While the techniques and algorithms can be generalized to suit to any parametric environment, the book illustrates its concepts using the scripting languages of one of the most powerful 3D visualization and animation design software systems

(Autodesk 3ds Max MAXScript), one of the most popular open-source Java-based scripting environments (Processing), and a brand new language specifically tailored for parametric and generative design (Autodesk DesignScript). This clear, accessible book will have a wide appeal to students and practitioners who would like to experiment with parametric techniques. Social scientists, whether earnest graduate students or tenured faculty members, clearly know the rules that govern good writing. But for some reason they choose to ignore those guidelines and churn out turgid, pompous, and obscure prose. Distinguished sociologist Howard S. Becker, true to his calling, looks for an explanation for this bizarre behavior not in the psyches of his colleagues but in the structure of his profession. In this highly personal and inspirational volume he considers academic writing as a social activity. Both the means and the reasons for writing a thesis or article or book are socially structured by the organization of graduate study, the requirements for publication, and the conditions for promotion, and the pressures arising from these situations create the writing style so often lampooned and lamented. Drawing on his thirty-five years' experience as a researcher, writer, and teacher, Becker exposes the foibles of the academic profession to the light of sociological analysis and gentle humor. He also offers eminently useful suggestions for ways to make social scientists better and more productive writers. Among the topics discussed are how to overcome the paralyzing fears of chaos and ridicule that lead to writer's block; how to rewrite and revise, again and again; how to adopt a persona compatible with lucid prose; how to deal with that academic bugaboo, "the literature." There is also a chapter by Pamela Richards on the personal and professional risks involved in scholarly writing. In recounting his own trials and errors Becker offers his readers not a model to be slavishly imitated but an example to inspire. Throughout, his focus is on the elusive work habits that contribute to good writing, not the more easily learned rules of grammar and punctuation. Although his examples are drawn from sociological literature, his conclusions apply to all fields of social science, and indeed to all areas of scholarly endeavor. The message is clear: you don't have to write like a social scientist to be one.

Elements of Parametric Design

The International Symposium on Smart Graphics 2005 was held from August 22 – 24, 2005 in the cloister Frauenwirth on the island of Frauenchiemsee, Germany.

"...there is a global network of academics, researchers and methodologists who will buy this book or want it in their institute libraries." Prof. John Harbraken "As the field of human computer interaction grows, this book is likely to be a basic resource." Prof. Chuck Eastman Design representation is necessary for all design activity. You will gain a guide to both theory and practical application in this discussion of representation as it occurs during the process of design. Goldschmidt and Porter give you perspectives on representational issues in design that are both informative and evocative of further inquiry. The unique

interdisciplinary approach brings a new dimension to the study of representation, benefiting the global network of researchers, students and practitioners in all areas of design. Rather than addressing the larger framework directly, a series of smaller case studies are presented, each dealing with aspects of representation in architecture and engineering. Binding together historical-cultural, cognitive-social and technological perspectives eliminates the need for further reading. Innovative research methods based on numerous well-illustrated examples will leave you with new ideas to build on. International contributors focus on worldwide research activities, offering you more than just an expansion of a single viewpoint. Design Representation delves into the common roots of representation in all design disciplines through case studies, historical investigations, theoretical constructs and programming. If you are involved in any design activity, this will be a truly exciting addition to your bookshelf.

Advances in Architectural Geometry is a symposium presenting both theoretical and practical work linked to new geometric developments applicable to architecture. This symposium aims to gather the diverse components of contemporary architectural trends which push the building envelope towards free form, and which respond to these design challenges with a renewed mathematical rigor. A research section of 26 papers is preceded by an interview with Frederic Migayrou (Deputy director of the Musee National d Art Moderne, Centre de Creation Industrielle Pompidou Centre), where he explores the larger context of free-form architecture with respect to contemporary architectural design and the last two centuries of structural engineering.

Take a theoretical approach to architecture with The Autopoiesis of Architecture, which presents the topic as a discipline with its own unique logic. Architecture's conception of itself is addressed as well as its development within wider contemporary society. Author Patrik Schumacher offers innovative treatment that enriches architectural theory with a coordinated arsenal of concepts facilitating both detailed analysis and insightful comparisons with other domains, such as art, science and politics. He explores how the various modes of communication comprising architecture depend upon each other, combine, and form a unique subsystem of society that co-evolves with other important autopoietic subsystems like art, science, politics and the economy. The first of two volumes that together present a comprehensive account of architecture's autopoiesis, this book elaborates the theory of architecture's autopoiesis in 8 parts, 50 sections and 200 chapters. Each of the 50 sections poses a thesis drawing a central message from the insights articulated within the respective section. The 200 chapters are gathering and sorting the accumulated intelligence of the discipline according to the new conceptual framework adopted, in order to catalyze and elaborate the new formulations and insights that are then encapsulated in the theses. However, while the theoretical work in the text of the chapters relies on the rigorous build up of a new theoretical language, the theses are written in ordinary language with the theoretical concepts placed in brackets. The full list of the 50 theses

affords a convenient summary printed as appendix at the end of the book. The second volume completes the analysis of the discourse and further proposes a new agenda for contemporary architecture in response to the challenges and opportunities that confront architectural design within the context of current societal and technological developments.

Leading practitioners of parametric and algorithmic design profile the most radical technologies reshaping architecture today, offering insight into their differences, potential and influence on design practice.

A comprehensive introduction to machine learning that uses probabilistic models and inference as a unifying approach. Today's Web-enabled deluge of electronic data calls for automated methods of data analysis. Machine learning provides these, developing methods that can automatically detect patterns in data and then use the uncovered patterns to predict future data. This textbook offers a comprehensive and self-contained introduction to the field of machine learning, based on a unified, probabilistic approach. The coverage combines breadth and depth, offering necessary background material on such topics as probability, optimization, and linear algebra as well as discussion of recent developments in the field, including conditional random fields, L1 regularization, and deep learning. The book is written in an informal, accessible style, complete with pseudo-code for the most important algorithms. All topics are copiously illustrated with color images and worked examples drawn from such application domains as biology, text processing, computer vision, and robotics. Rather than providing a cookbook of different heuristic methods, the book stresses a principled model-based approach, often using the language of graphical models to specify models in a concise and intuitive way. Almost all the models described have been implemented in a MATLAB software package—PMTK (probabilistic modeling toolkit)—that is freely available online. The book is suitable for upper-level undergraduates with an introductory-level college math background and beginning graduate students.

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