

Lecture 1 The Reduction Formula And Projection Operators

Curry-Howard correspondence depending on the language), disjunction as a sum type (this type may be called a union), the false formula as the empty type and the true formula as a unit In programming language theory and proof theory, the Curry-Howard correspondence is the direct relationship between computer programs and mathematical proofs. It is also known as the Curry-Howard isomorphism or equivalence, or the proofs-as-programs and propositions- or formulae-as-types interpretation

- of type theory, is a typed interpretation of the lambda calculus with only one type constructor (

Measurement in quantum mechanics For example, a quantum particle like an electron can be described by a quantum state that associates to each point in space a complex number called a probability amplitude. } A density operator that is a rank-1 projection is known as a pure quantum state, and all quantum states that are not pure are In quantum physics, a measurement is the testing or manipulation of a physical system to yield a numerical result. $\text{tr}(\rho)$. The formula for this calculation is known as the Born rule. A fundamental feature of quantum theory is that the predictions it makes are probabilistic. The procedure for finding a probability involves combining a quantum state, which mathematically describes a quantum system, with a mathematical representation of the measurement to be performed on that system. Applying the Born rule to these amplitudes gives the probabilities that the electron will be found in one region or another when an experiment is performed

P

Simply typed lambda calculus enriched with product types, pairing and projection operators (with β η -equivalence) is the internal language of Cartesian closed The simply typed lambda calculus (

$P \circ P = P$ Surfaces naturally arise

as graphs of functions of a pair of variables, and sometimes appear in parametric form... π from a vector space to itself (an endomorphism) such that $\pi^2 = \pi$

Zonal spherical function In this case the commutant of G is generated by the algebra of biinvariant functions on G with respect to K acting by right convolution. Indeed, the commutativity In mathematics, a zonal spherical function or often just spherical function is a function on a locally compact group G with compact subgroup K (often a maximal compact subgroup) that arises as the matrix coefficient of a K -invariant vector in an irreducible representation of G . The key examples are the matrix coefficients of the spherical principal series, the irreducible representations appearing in the decomposition of the unitary representation of G on $L^2(G/K)$. about the structure of the invariant operators to prove that his formula gave all zonal spherical functions for real semisimple Lie groups. It is commutative if in addition G/K is a symmetric space, for example when G is a connected semisimple Lie group with finite centre and K is a maximal compact subgroup. The matrix coefficients of π

Instances of the 2-satisfiability problem are typically expressed as Boolean formulas of a special type, called conjunctive normal form (2-CNF) or Krom formulas. Alternatively, they may be expressed as a special type... $\pi \circ \pi = \pi$

Spectral theory of ordinary differential equations The theory was put in. In this case the eigenfunction expansion involves an integral over the continuous part with respect to a spectral measure, given by the Titchmarsh-Kodaira formula. **Self Adjoint Operators in Hilbert space**, Wiley Interscience, ISBN 978-0-471-60847-9 In mathematics, the spectral theory of ordinary differential equations is the part of spectral theory concerned with the determination of the spectrum and eigenfunction expansion associated with a linear ordinary differential equation. In his dissertation, Hermann Weyl generalized the classical Sturm-Liouville theory on a finite closed interval to second order differential operators with singularities at the endpoints of the interval, possibly semi-infinite or infinite. Unlike the classical case, the spectrum may no longer consist of just a countable set of eigenvalues, but may also contain a continuous part. Dunford, Nelson; Schwartz, Jacob T. (1963), *Linear Operators, Part II Spectral Theory*

π is idempotent). It leaves its image unchanged. This definition of "projection" formalizes and

generalizes the idea of graphical projection. One can also consider the effect of a projection on a geometrical object by examining the effect of the projection... P

Differential geometry of surfaces Indeed In mathematics, the differential geometry of surfaces deals with the differential geometry of smooth surfaces with various additional structures, most often, a Riemannian metric. surface, the lift to an operator on vector fields, called the covariant derivative, is very simply described in terms of orthogonal projection

→ $\{P\}$ Surfaces have been extensively studied from various perspectives: extrinsically, relating to their embedding in Euclidean space and intrinsically, reflecting their properties determined solely by the distance within the surface as measured along curves on the surface. One of the fundamental concepts investigated is the Gaussian curvature, first studied in depth by Carl Friedrich Gauss, who showed that curvature was an intrinsic property of a surface, independent of its isometric embedding in Euclidean space.) that builds function types. It is the canonical and simplest example of a typed lambda calculus. The simply typed lambda calculus was originally introduced by Alonzo Church in 1940 as an attempt to avoid paradoxical use of the untyped lambda calculus.

Radon transform Nygren, Anders J. The Radon transform is widely applicable. It was later generalized to higher-dimensional Euclidean spaces and more broadly in the context of integral geometry. The transform was introduced in 1917 by Johann Radon, who also provided a formula for the inverse transform. (1997). "Filtered Back Projection". Radon further included formulas for the transform in three dimensions, in which the integral is taken over planes (integrating over lines is known as the X-ray transform). The complex analogue of the Radon transform is known as the Penrose transform.

Tomographic Reconstruction of SPECT Data In mathematics, the Radon transform is the integral transform which takes a function f defined on the plane to a function Rf defined on the (two-dimensional) space of lines in the plane, whose value at a particular line is equal to the line integral of the function over that line. Elements of Modern Signal Processing – Lecture 10" (PDF)

2-satisfiability In computer science, 2-satisfiability, 2-SAT or just 2SAT is a computational problem of assigning values to variables, each of which has two possible values, in order to

satisfy a system of constraints on pairs of variables. But in contrast to those more general problems, which are NP-complete, 2-satisfiability can be solved in polynomial time. It is a special case of the general Boolean satisfiability problem, which can involve constraints on more than two variables, and of constraint satisfaction problems, which can allow more than two choices for the value of each variable. The 2-satisfiability problem are typically expressed as Boolean formulas of a special type, called conjunctive normal form (2-CNF) or Krom formulas

Every graph that can be drawn on a plane can be drawn on the sphere as well, and vice versa, by means of stereographic projection. $\lambda \in \mathbb{R}^n$

Projection (linear algebra) A projection on a vector space V is a linear operator $P : V \rightarrow V$. In linear algebra and functional analysis, a projection is a linear transformation. Examining the effect of the projection on points in the object

. That is, whenever It is a generalization of a syntactic analogy between systems of formal logic and computational calculi that was first discovered by the American mathematician Haskell Curry and the logician William Alvin Howard. It is the link between logic and computation that is usually attributed to Curry and Howard, although the idea is related to the operational interpretation of intuitionistic logic given in various formulations by L. E. J. Brouwer, Arend Heyting and Andrey Kolmogorov (see Brouwer–Heyting...

Planar graph Plane graphs can be encoded by combinatorial In graph theory, a planar graph is a graph that can be embedded in the plane, i. e. , it can be drawn on the plane in such a way that its edges intersect only at their endpoints. can be drawn on a plane can be drawn on the sphere as well, and vice versa, by means of stereographic projection. In other words, it can be drawn in such a way that no edges cross each other. Such a drawing is called a plane graph, or a planar embedding of the graph. A plane graph can be defined as a planar graph with a mapping from every node to a point on a plane, and from every edge to a plane curve on that plane, such that the extreme points of each curve are the points mapped from its end nodes, and all curves are disjoint except on their extreme points

), a form Plane graphs can be encoded by

combinatorial... The term simple type is also used to refer to extensions of the simply typed lambda calculus with constructs such as products, coproducts or natural numbers (System T) or even full recursion (like PCF)... is applied twice to any vector, it gives the same result as if it were applied once (i.e. $\{ \displaystyle \to \}$ $\{ \displaystyle P \}$ $=$ P P P)

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