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Algebraic Statistics
A Seminar

Summer Term 2015
Every other Thursday, from 10 to 2

Algebraic statistics is a relatively new field full of exciting new developments. It combines questions and techniques from stochastics with those from (computational) algebraic geometry as well as convexity and polyhedral combinatorics.

Here is a baby example. Consider two random variables X and Y, taking values in $\{0, 1\}$. Their joint distribution is characterized by the four probabilities $p_{00}, p_{01}, p_{10}, p_{11}$ of the four possible events: four non-negative numbers, summing to 1 — a point in a tetrahedron.

The Variables are said to be independent if these probabilities satisfy the polynomial equation $p_{00}p_{11} - p_{01}p_{10} = 0$. The statistical model "independence" — the set of all independent distributions — is an algebraic surface inside our tetrahedron.
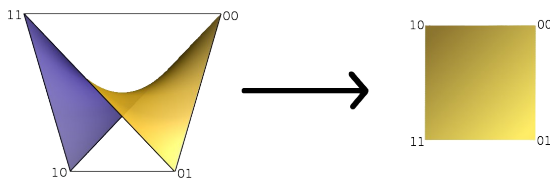
To test the hypothesis "X and Y are independent" amounts to deciding whether or not a measured point of observed frequences is close to that surface.

Mapping a point of the model to its so called sufficient statistics, maps our surface to a convex polytope, in this case, the unit square.

The features of this example carry over to many, many relevant statistical models. The above unit square carries the name "marginal polytope" in statistics and the name "moment polytope" in algebraic geometry.

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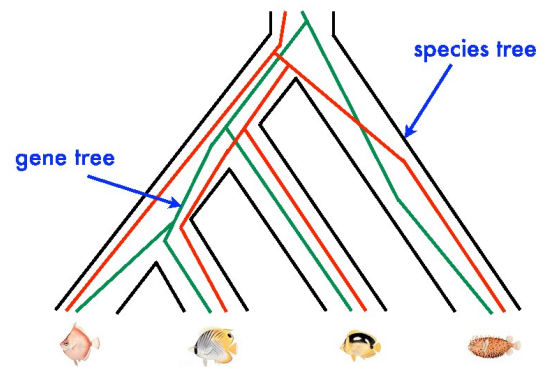
Preliminary Meeting:
Thursday, February 26 at 10
FU Berlin, Arnimallee 3
room 130 (rear building)

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There will be introductions into the field(s) for students unspoiled by prior knowledge. We do expect, however, what people call "mathematical maturity." The main prerequisite for this seminar is a lot of curiosity.

`http://ehrhart.math.fu-berlin.de/lehre/2015-SS/AlgStat/`