A Little Survey of Induction

Inductive inference is…

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(Overwhelming Majority view) …Ampliative inference	Evidence lends support to an hypothesis, while not establishing it with deductive certainty.
(Minority view, largely historical) …Generalization	Inference from less general to the more general. May also be deductive. Example: "Perfect induction."

Rules of Detachment?

YES	NO
Evidence, Hence hypothesis "Induction." "Inductive inference"	Evidence confirms hypothesis. "Confirmation"

Three basic ideas
drive all accounts of inductive inference.

| Family	Inductive Generalization	Hypothetical Induction	Probabilistic Induction
Principle	An instance confirms the generalization.	Ability to entail the evidence is a mark of truth	Degrees of belief governed by a calculus.
Archetype	Enumerative induction	Saving the phenomena in astronomy.	Probabilistic analysis of games of chance
Weakness	Limited reach of evidence	Indiscriminate confirmation	Applicable to non-stochastic systems?

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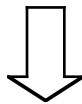
Families develop through efforts to remedy weaknesses.

Hybrids: Some accounts of induction straddle families.
e.g. Achinstein's view, modern demonstrative, eliminative induction

Inductive Generalization

Principle	An instance confirms the generalization.
Archetype	Enumerative Induction
Weakness	Limited reach of evidence. Some A's are B → All A's are B only narrowly applicable.

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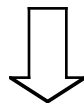
Elaborations

Hempel's Satisfaction Criterion	Extend basic principle from simple syllogistic logic to first order predicate logic.
Mill's Methods	Generalize instances of necessary and sufficient conditions and interpret as causes.
Glymour's Bootstrap	Derive instance of hypothesis with assistance of any available theory.
Demonstrative Induction	Deduce hypothesis from evidence using auxiliary theory.

Hypothetical Induction

Principle	Ability to entail the evidence is a mark of truth.
Archetype	Saving the phenomena.
Weakness	Too indiscriminate. Frivolous conjunction: A&B entails A; so A confirms B, for any B.

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Elaborations

	E confirms H if H (and auxiliaries) entail E AND…	Examples
Exclusionary accounts. Error statistics (Mayo) Inference to common cause (Salmon, Janssen)	…E most likely wouldn't be true, if H were false	Controlled studies. Perrin's arguments for atoms.
Simplicity	… H is the simplest.	Curve fitting.
Abduction: Inference to the best explanation (Pierce, Harman, Lipton)	…H is the best explanation.	Galactic red shift. Controlled studies of telepathy.
Reliabilism (Popper, Lakatos)	…H has been generated by a reliable method.	Any expert investigating.

Probabilistic Induction

Principle	Degrees of belief governed by a calculus.
Archetype	Probabilistic analysis of games of chance.
Weakness	Apply a calculus designed for dice games to beliefs about non-stochastic systems? Spurious numerical precision? Priors? Ignorance vs. disbelief?

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Elaborations

Full-blown Bayesianism	Interpretive agonies. Subjective, objective, logical? Justifications: Dutch book arguments, representation theorems. Washing out of the priors.
Extended Bayesianism	Convex sets of probability distributions. (and more)
Alternative Calculi	Shafer-Dempster theory. Possibility theory. **Theory of random propositions.**

Properties and Tendencies

Family	Distance between evidence and hypothesis	Justification
Inductive Generalization ("bottom up")	Close. Invites logic of discovery.	Self evidence. Case studies.
Hypothetical Induction ("top down")	Distant. Leans towards under-determination	Self evidence. Case studies.
Probabilistic Induction ("relational")		Elaborate and sophisticated. (Bayesians)

Rule of detachment?

Source:
John D. Norton, "A Little Survey of Induction," in P. Achinstein, ed., Scientific Evidence: Philosophical Theories and Applications. Johns Hopkins University Press, 1905. pp. 9-34.