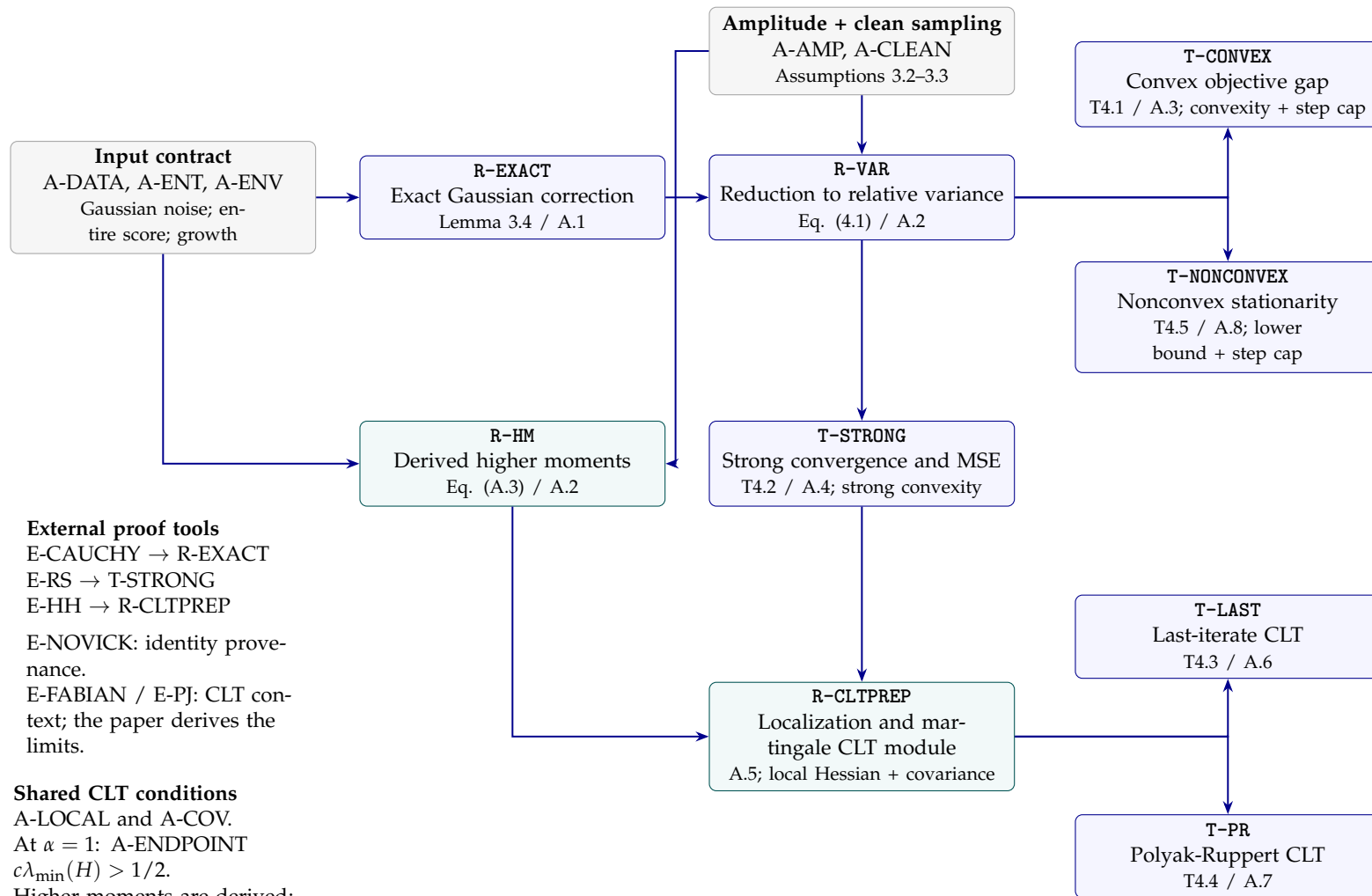


CCSGD: theorem dependency graph

Source snapshot: 11 October 2026

Solid arrows: proof dependencies. Dashed arrows: conditional reuse. Assumption groups label the contract; each result's full assumptions and source coordinates are in the JSON. Transitive result edges are suppressed here.

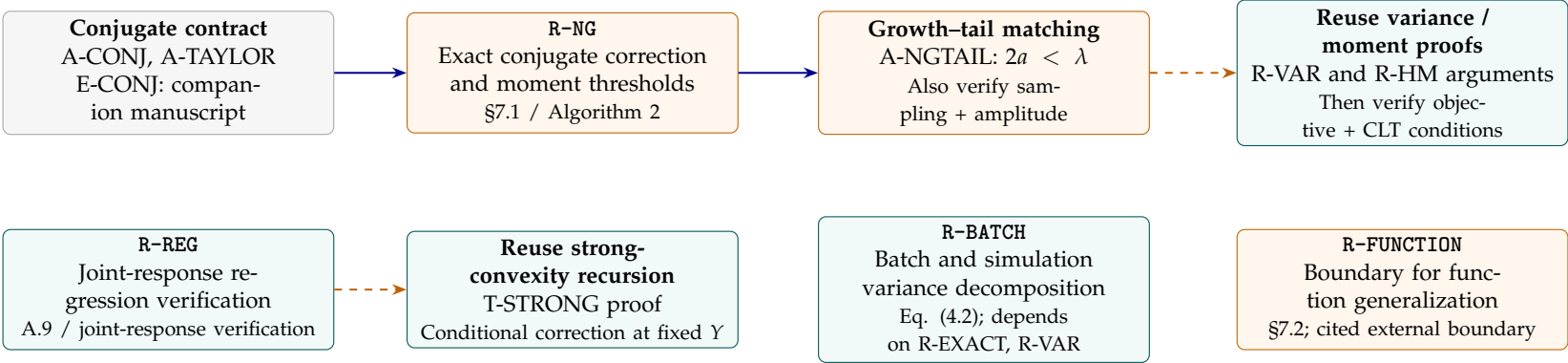


External proof tools
E-CAUCHY → R-EXACT
E-RS → T-STRONG
E-HH → R-CLTPREP
E-NOVICK: identity provenance.
E-FABIAN / E-PJ: CLT context; the paper derives the limits.

Shared CLT conditions
A-LOCAL and A-COV.
At $\alpha = 1$: A-ENDPOINT
 $c\lambda_{\min}(H) > 1/2$.
Higher moments are derived; they are not an added assumption.

Do not infer: nonconvex stationarity $\Rightarrow$ global optimizer; exact unbiasedness $\Rightarrow$ clean-oracle covariance; pointwise finite moments $\Rightarrow$ a deterministic global variance bound.

Extensions, proof locations, and external status



Stable result registry

ID	Paper location	Proof location
R-EXACT	Lemma 3.4	A.1
R-VAR	Eq. (4.1)	A.2
R-HM	Eq. (A.3)	A.2
R-BATCH	Eq. (4.2)	Before T4.1
T-CONVEX	Theorem 4.1	A.3
T-STRONG	Theorem 4.2	A.4
R-CLTPREP	Appendix A.5	A.5
T-LAST	Theorem 4.3	A.5–A.6
T-PR	Theorem 4.4	A.5, A.7
T-NONCONVEX	Theorem 4.5	A.8
R-REG	Appendix A.9	A.9
R-NG	Section 7.1	Section 7.1
R-FUNCTION	Section 7.2	External result

R-NG is a conditional extension discussed with a derivation, not a newly numbered non-Gaussian convergence theorem. R-FUNCTION records an external scope restriction.

External dependency status

ID	Status in this repository
E-CAUCHY	Standard complex-analysis tool; not reproved.
E-NOVICK	Cited historical identity; correction reproved internally.
E-RS	Cited convergence theorem; recursion verified internally.
E-HH	Cited martingale CLT; its conditions checked internally.
E-FABIAN	CLT context; product/covariance derivation is internal.
E-PJ	Averaging context; both step-size regimes derived internally.
E-CONJ	Companion source consulted; not bundled or independently certified.
E-STEFANSKI	Cited Gaussian function-class boundary; not reproved.

Machine version. `theorem_graph.json` contains every assumption, complete conclusion, direct result dependency, proof file/line/anchor, PDF page, and external status. It is the source for this diagram.

Review status. A user-provided 6 Astra review reports no major gaps for `main(6).pdf`; file-level correspondence with this snapshot is unconfirmed. See `reviews/6_astra/`. This graph is not independent certification.