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Robot 'foundation models' guguddoon dhugumaan caalaatti hojjetu? Deebii of-eeggannoo: xiqqoo eeyyee — studies hedduun garuu adda baasuu hin danda'an

Toyota Research Institute 'large behavior models' — robot policies diverse manipulation data sa'aatii ~1,700 irratti pretrained — from-scratch single-task policies waliin unusually rigorous blind, randomized, large-sample trials (~1,800 real-world, 47,000+ simulation) keessatti test godhe. Per-task finetuning booda big models average irratti caalan, task-specific data ~3–5× xiqqaa barbaadan, distribution shift jalatti robust caalaa turan; performance pretraining data waliin smooth ta'een ol ka'e. Garuu finetuning malee single-task models consistently hin caalle, effects hedduun sample guddaa malee hin mul'anne, data-normalisation filannoo idilee architecture caalaa impact qabaate. Kun robot-foundation-model direction'f measured support dha — general-purpose robot miti, zero-shot generalist miti, 'emergent leap' miti — fi robotics hedduun statistical noise safaraa jiraachuu mala jechuun akeekkachiisa.

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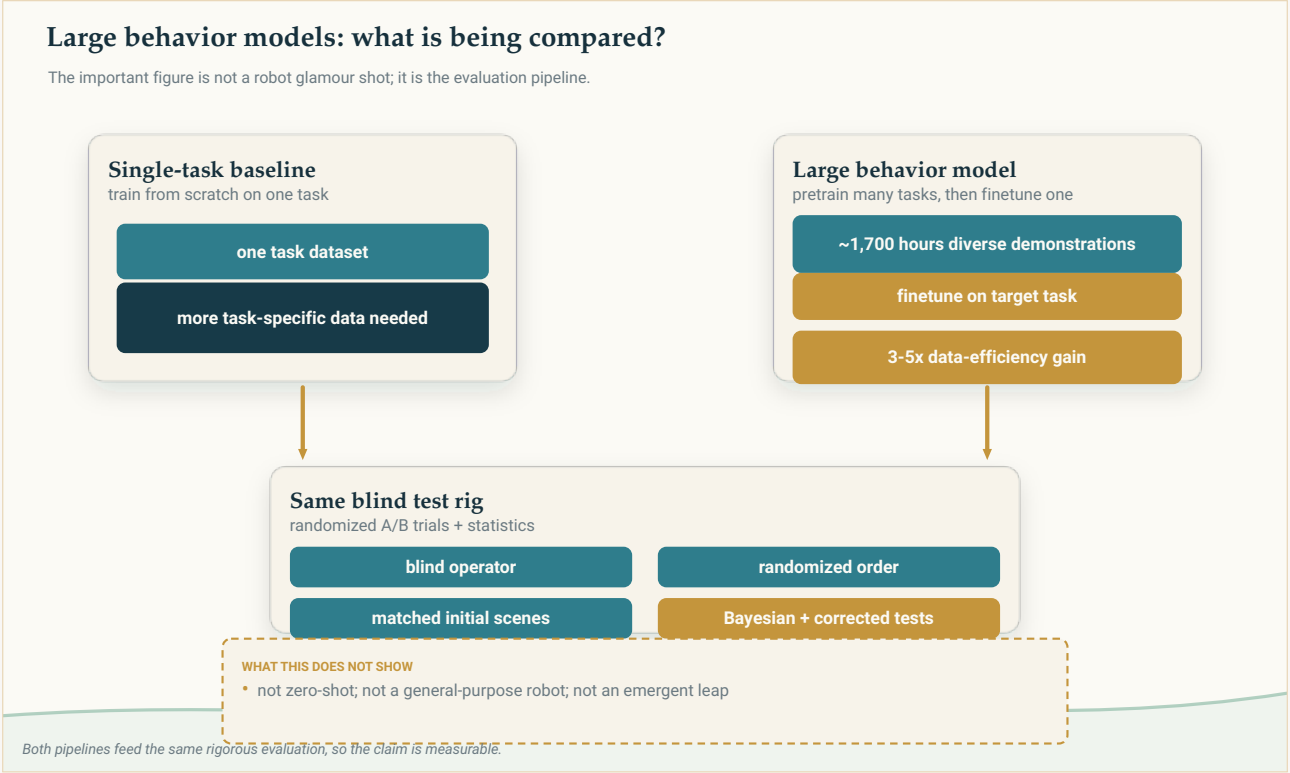
Paper: *A Careful Examination of Large Behavior Models for Multitask Dexterous Manipulation*, Toyota Research Institute Large Behavior Model Team — J. Barreiros, A. Beaulieu, et al.; senior authors incl. R. Ambrus, B. Burchfiel, S. Feng, H. Kress-Gazit (Cornell), R. Tedrake, Science Robotics (2026); preprint arXiv:2507.05331 · DOI: 10.1126/scirobotics.aea6201

Barruu robot tokko kan subject isaa dhugaa honesty ta'e

Robotics yeroo ammaa "foundation moodeela" rush keessa jira. Yaadni isaa afaan fi image AI irraa dhufe: robot hojii tokko tokkoof addatti leenjisuu irra, **"guddaa amala moodeela" (LBM)** guddaa tokko demonstrations hedduu, garaagaraa irratti leenjisi; sirna hojii bal'aa danda'u, saffisaan adapt godhu argadhu. Gammachuun fi investment guddaa dha. Mata-dureen ofumaan barreeffama: *general-purpose robot brains dhufaniiru.*

Barruu Toyota Research Institute irraa dhufe kun mata-duree sana barreessuu diduusaatiin nama hawwata. Contribution isaa robot flashy caalaa miti. Gaaffii salphaa fakkaatu garuu ulfaataa ta'e tokko of-eeggannoodhaan ilaala — *big-model mala dhugumaan caalaatti hojjetaa? Akkamitti beekna?* — istaatistikii damee kana keessatti, barreessitoota irraa akka jedhame, yeroo baay'ee hin argamne fayyadamuun. Deebiin "eeyyee, garuu..." gatii qabu dha; robotics hedduun noise safaraa jiraachuu mala jechuun akeekkachiisa.



Mala lamaan odeeffannoo garee dhoksee, akka carraatti ramadame madaallii wal-fakkaataa keessa seenu. Himannaa barruu kanaa robot foundation moodeelota zero-shot generalists ta'an miti; pretraining, yeroo sirriitti safaramu, daataa efficiency fi robustness fooyyessuu danda'a.

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Barreessitoonni maal godhan

LBM hiika addaa keessatti ijaaran: **diffusion-based visuomotor policies** — Diffusion Transformer kan camera images, afaan instruction gabaabaa fi robot joint positions dubbisee motor commands gabaabaa 10 Hz irratti baasu. Isaan daataa demonstrations robot naannoo **sa'aatii 1,700** — hojiiwwan adda addaa 500 ol in-house fi ummataaf banaa kuusaa daataa — irratti **pretrain** godhan; achiis hojii tokko tokko irratti **finetune** godhan. Walbira qabuu'n yeroo hunda **single-task policy hojii sana daataa qofa irratti irraa scratch leenjifame** waliin.

Garuu heart barruu kanaa *madaallii* dha; barreessitoonni ijoo bu'aa akka ta'etti ilaalu. Of gowwoomsuu irraa of eeguuf:

- **odeeffannoo garee dhoksee, akka carraatti ramadame A/B qorannoo** addunyaa dhugaa keessatti fayyadaman — operator robot policy kam akka qoramu hin beeku, order tasaa ture.
- **To'atame, repeatable jalqabaa haalawwan** — yaalii dura mul'ata image overlay waliin walsimsiisan.
- **Yaalii counts guddaa** — haala addunyaa dhugaa rollouts 50 hojii tokko, policy tokko, haala tokkoof; fakkeessuu keessatti 200. Waliigalaan **odeeffannoo garee dhoksee haala addunyaa dhugaa rollouts naannoo 1,800 fi fakkeessuu rollouts 47,000 ol**.
- **istaatistikii sirrii** — milkaa'ina carraa Bayesian tilmaamota, pairwise hypothesis qormaatawwan multiple-comparison correction waliin; dogoggora bars ilaalu qofa miti. Human-scored yaaliiwwan keessaa quarter tokko irratti QA pass illee godhanii scoring dogoggora safaran.

[video pending]

Moodeelota breakfast table qopheessan side-by-side: bitaa single-task sadarkaa jalqabaa, mirga LBM. Videos lamaan 1x speed irratti. Kun hojii evaluated tokko qofa; general-purpose autonomy ragaa miti.

Machinery kun qabxii dha. Barruu guutuun, kana malee improvement dhugaa fi luck adda baasuun rakkisaa ta'uu irratti argument dha.

Maal argatan

Big moodeelota finetuned ta'an irraa-scratch single-task moodeelota caalan — giddugaleessa irratti. Hojiiwwan hedduu walitti qabanii yoo ilaalan, LBM pretrain ta'ee achiis hojii irratti finetune ta'e policy hojii sana irratti irraa scratch leenjifame caalaatti hojjete, fakkeessuu fi addunyaa dhugaa lamaan keessatti; garaagarummaan akka istaatistikiitti hiika qabu ture. Hojii tokko tokko irratti finetuned LBM irraa-scratch waliin akka istaatistikiitti as-good-or-better ture jechuun haalawwan hunda jechuun ni danda'ama (haala addunyaa dhugaa 3/3, fakkeessuu 15/16).

Win guddaa fi ifaan daataa efficiency dha. Finetuned LBM raawwii irraa-scratch waliin wal-qixa ta'e argachuuf task-specific daataa **3–5× xiqqaa** naannoo barbaade. haala addunyaa dhugaa hojii tokko keessatti (breakfast table qopheessuu), LBM demonstrations keessaa **15%** qofa irratti finetune ta'e, irraa-scratch policy **100%** irratti leenjifame caale.

Pretraining yeroo haalawwan jijjiiraman caalaatti gargaara. Qormaata environment leenjii haalawwan irraa deliberately jijjiirame ("distribution jijjiirama") yeroo ta'u, advantage finetuned LBM *guddate*. Fakkeessuu set tokko keessatti normal haalawwan irratti hojiiwwan 16 keessaa 3 irratti irraa-scratch akka istaatistikiitti caale; distribution jijjiirama jalatti 10/16 irratti. Dhugaa hojiirra oolmaa leenjii irraa yeroo hunda xiqqoo socho'u waan ta'eef, robustness kun bu'aa hojiirra oolu baay'ee barbaachisaa ta'uu mala.

Pretraining daataa caalaa → raawwii caalaa, suuta. Daataa pretraining dabalaa deemeen raawwii steady ol ka'e; safartuuwwan qoraman irratti **jump sudden yookaan "emergent" leap hin turre**. Faayidaa qabu, predictable, dramatic miti.

Garuu generalist-without-finetuning seenaa hin dhaabbanne. Pretrained LBM *zero-shot* — task-specific finetuning malee — single-task policies yeroo hunda hin caalle. Network tokko hojiiwwan hedduu yeroo tokko hojjachuu danda'e, garuu "just ajaja it" dream as keessatti hin mirkanoofne; barreessitoonni afaan encoder xiqqaa isaanii brittle ta'uu isa keessaa kutaa tokkoof sababa jedhu.

Gains xiqqoo waan ta'aniif miss gochuun — yookaan fake gochuun — salphaa ture. Dhiibbaawwan hedduun baay'ina saamudaa yeroo barame caalaa guddaa fi careful qormaatawwan qofa keessatti ifa ta'an. Barreessitoonni ifatti, hammamtaa dhiibbaawwan fi noise jiru irraa **robotics barruulee hedduun istaatistikii noise safaraa jiraachuu balaa guddaa qaba** jedhu. Filannoo idilee — daataa akkamitti *normalise* godhamu — architectural jijjiiramoota caalaa bu'aa irratti dhiibbaa qabaachuu argan; pretraining keessatti normalisation **bug** tokko evaluations xumuramanii *booda* qofa argame.

Kun maal jechuu akka malu

Dubbisuu deggaramuu danda'u: diverse robot daataa irratti bal'aa pretraining ingredient dhugaa fi gatii qabu dha — hojii haaraa tokkoof daataa xiqqaa barbaachisa, world leenjii waliin hin wal-simne yeroo ta'u policy jabaataa godha. Kun direction damee'n irratti bet godhu deeggara. Garuu gains *moderate fi conditional* dha (baay'inaan finetuning booda mul'atu; walitti qabame fi stress jalatti caalaatti ifa), waliigalaa robot drop-in dhufuu miti.

Hiikni tasgabbaa'aa, barbaachisaa caalaa methodological dha. Barruu kun measuring-stick fakkaata: robot policy irratti himannaa amanamaa godhuuf ragaa hammam akka barbaachisu agarsiisa, akkasumas excitement maxxanfame hedduun ragaa xiqqoo irratti hirkachuu mala jedhu. Damee kun moodeela biraa caalaa correction kana barbaada.

Kun maal *hin* mirkaneessu

- **General-purpose robot miti.** Wins architecture addaa (diffusion policies), hojii hojii irratti fine-tune ta'e, to'atame settings fi teleoperated demonstrations irraa argame — autonomous robot hojii haaraa kamuu command qofa irratti hojjatu miti.
- **Zero-shot** fayyadama hin mirkaneessu. Finetuning malee big moodeela single-task baselines con-

sistently hin caalle.
- **"Emergent leap"** ragaa miti. Scaling suuta improvement fide; discontinuity "achumaan dandeettii haaraa baname" jedhu hin jiru.
- Lakkoofsawwan **walbira qabamee fi lab-bound** dha. Absolute milkaa'ina saffisoota deliberately ~50%tti qindaa'an walbira qabuwwan sensitive gochuuf; haala addunyaa dhugaa amanamummaa measure miti, hojii kun architecture tokko lab tokko irraa.
- Policy tokko maaliif milkaa'a yookaan kufa **hin murteessu**; hojiiwwan tokko tokko big moodeela caalaatti hamaa ta'e gabaasa godhaman garuu hin ibsamne.
- Evaluation rig ala **nageenya, autonomy, hojiirra oolmaa** irratti homaa hin jedhu.

Ragaan hammam cimaa dha?

Central comparative himannoowwan — finetuned LBMs irraa-scratch baselines walitti qabame keessatti caalu, daataa yeroo hedduu xiqqaa barbaadu, distribution jijjiirama jalatti jabaataa caalaa ta'u — irratti ragaa cimaa fi unusually to'atame dha: odeeffannoo garee dhoksee, akka carraatti ramadame, large-saamudaa, akka istaatistikiitti tested, scoring QA waliin. Methodology mata-duree conclusions jechuun ni danda'ama fuula gatii irratti fudhachuuf gahaa ta'e keessaa muraasa haala dha.

Caveats amanamoon barreessitoota ofii irraa dhufu. Dogoggora bars isaanii carraa tasaa *madaallii* capture godhu, garuu carraa tasaa *leenjii* **hin qabne** — moodeela wal-fakkaataa yeroo lama train godhi, policy hiika qabuun adda ta'e argachuu dandeessa; variation sun istaatistikii keessa hin jiru. haala addunyaa dhugaa hojii tokkoon yaaliiwwan 50 qaba, medium dhiibbaawwan arguuf ga'a, xiqqaa dhiibbaawwan miss gochuu danda'a. afaan-conditioning modest encoder fayyadame, kanaaf "robottti maal gochuu akka qabu himi" himannoowwan guddaa caalaa sirnoota irratti adda ta'uu danda'u. Normalisation bug post-hoc argames ifatti disclose godhan. Kanneen ijoo argannoowwan hin balleessan, garuu barruun damee yeroo baay'ee rakkoo akkanaa callisee darbu jedhee akeekkachiisu waliin wal-simu.

Madda note: explainer kun barreessitoonni' barruu duraa irratti hundaa'e. Journal-published gosa retrieve gochuu hin dandeenye, kanaaf barruu duraa fi maxxanfame text gidduu jijjiiramoota jiraachuu isaanii hin sakattaane.

Maaliif barbaachisaa dha

"Robot foundation moodeelota" jechuun phrase overclaim'f salphaa dha; qorannoo akkanaa *"hojjete!"* yookaan *"overhyped dha"* jechuun lama keessaa tokko ta'een dubbisuun salphaa. Take sirrii lamaan caalaa faayidaa qabu: diverse daataa irratti pretraining faayidaa dhugaa, safarame, garuu moderate fide — hojii tokkoof daataa xiqqaa, robustness caalaa — raawwii'n safartuu waliin predictable ta'een fooyya'a.

Sababni gadi fagoon barruu kun damee ofii isaa irratti rigor isaa fayyadamu. Dhiibbaawwan dhugaa

sloppy madaallii keessatti baduuf hanga xiqqaa ta'uu fi daataa normalisation akka boring ta'e architectural novelty caalaa rukuttaa qabaachuu danda'u agarsiisuun, robot-learning progress hedduun safartuu jabaataa malee amanamuu akka hin qabne argument godha. Barruu credibility isaa bu'aa fi wish gidduu garaagarummaa eeguuf fayyadamu leaderboard irra ol ba'uu caalaa muraasa fi valuable dha.

Cuunfaa gabaabaa

Toyota Research Institute keessatti qorattoonni "guddaa amala moodeelota" — diffusion-based robot policies diverse manipulation daataa sa'aatii ~1,700 irratti pretrained — leenjisan; irraa-scratch single-task policies waliin protocol unusual rigor qabuun qoran: odeeffannoo garee dhoksee, akka carraatti ramadame, large-saamudaa (haala addunyaa dhugaa ≈1,800 fi fakkeessuu 47,000+ yaaliiwwan), istaatistikii dhugaa waliin. Per-task finetuning booda big moodeelota walitti qabame keessatti reliably caalan, task-specific daataa **3–5× xiqqaa** barbaadan, haalawwan jijjiiraman yeroo ta'u **jabaataa caalaa** turan; pretraining daataa dabalaa deemeen raawwii suuta fooyya'e. Garuu **finetuning malee** single-task moodeelota consistently hin caalle; dhiibbaawwan tokko tokko saamudaa sizes guddaa malee hin mul'anne; data-normalisation filannoo idilee architecture caalaa rukuttaa qabaate. Kun direction robot-foundation-model irratti safarame support cimaa dha — **general-purpose robot miti, zero-shot generalist miti, "emergent leap" miti** — akkasumas robotics hedduun noise safaraa jiraachuu mala jechuun akeekkachiisa.

Sakatta'a ifaa

barruun maal agarsiisa: Rigorous, odeeffannoo garee dhoksee, akka istaatistikiitti powered madaallii (≈1,800 haala addunyaa dhugaa + 47,000+ fakkeessuu rollouts) keessatti multitask-pretrained-then-finetuned diffusion policies (LBMs) walitti qabame irratti irraa-scratch single-task policies caalu, equivalent raawwii argachuuf task-specific daataa ~3–5× xiqqaa barbaadu, distribution jijjiirama jalatti jabaataa caalaa ta'u; raawwii pretraining daataa waliin smoothly safartuu godha.

Waan amansiisaa ta'e garuu hin mirkanoofne: Faayidaawwan kun vision-afaan-action moodeelota baay'ee guddaa irratti illee transfer gochuu; smooth scaling tested daataa daangaa ala itti fufuu.

Waan hin agarsiifne: General-purpose yookaan zero-shot robot (finetuning malee wal-simu advantage hin jiru); "emergent" dandeettii jump; task-level failures addaa maaliif akka ta'an; absolute haala addunyaa dhugaa amanamummaa (milkaa'ina saffisoota sensitivity'f ~50%tti tune ta'an); nageenya yookaan autonomous hojiirra oolmaa.

Daangaawwan ijoo: istaatistikii madaallii carraa tasaa qabata, leenjii-run carraa tasaa miti; haala addunyaa dhugaa yaaliiwwan hojii tokkoof 50 xiqqaa dhiibbaawwan miss gochuu danda'a; architecture tokko fi lab tokko; afaan encoder modest; data-normalisation bug evaluations booda argame; xiinxala barruu duraa irratti hundaa'e (maxxanfame gosa hin sakattaane).

Dubbisaan waliigalaa amanamummaa hammam qabaachuu qaba? Multitask pretraining + finetuning faayidaawwan dhugaa, moderate — keessumaa daataa efficiency fi robustness — kennu fi baay'ee of-eeggannoodhaan safarame ta'uu irratti amanamummaa guddaa. Kun **general-purpose yookaan zero-shot robot miti** fi **emergent leap miti** jechuun amanamummaa guddaa. Gains moodeelota guddaa irratti hammam safartuu godhan irratti medium. Barreessitoota akeekkachiisa dhiibbaawwan damee kanaa xiqqaa waan ta'aniif under-powered qorannoowwan noise gabaasuu malu jedhu serious fudhachuu qaba. Stance sirrii: mala irratti safarame optimism, robot-AI bu'aawwan istaatistikii backing akkanaa hin qabne irratti healthy skepticism.

Maddoota

arXiv:2507.05331
https://arxiv.org/abs/2507.05331

Peer-reviewed version (not retrieved) — Science Robotics, 10.1126/scirobotics.aea6201
https://doi.org/10.1126/scirobotics.aea6201

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