Laïcité-by-Design: Operationalizing Religious Neutrality Audits for French-Language AI in Public Administration

A neutral-equivalence, paired-prompt audit of language and decision tasks with reproducible artifacts

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Résumé en français. Le droit français impose la neutralité religieuse (*laïcité*) aux services publics. Nous proposons un test reproductible et chiffré pour vérifier, avant déploiement, qu'un modèle ou un prompt décisionnel traite de façon équivalente les lieux religieux et les lieux publics neutres (seuil δ calibré sur des lieux neutres). Dans nos exécutions, CamemBERT-base respecte ce seuil alors que XLM-R échoue au niveau « langage » mais passe en décision/modération. Ce protocole complète les exigences du *AI Act* européen (entrée en vigueur le 1er août 2024) en fournissant une vérification opérationnelle de neutralité, utile à l'achat public et à la gestion des mises à jour.

Abstract

France imposes a constitutional duty of religious neutrality (*laïcité*) on public services and agents. While French law, institutions, and scholarship articulate neutrality and transparency requirements for algorithmic decisions in administration, there remains a gap between legal principles and concrete, quantitative tests for AI systems. We propose *Laïcité-by-Design*, an operational audit for French-language models and decision prompts. The audit uses (i) paired prompts contrasting religious venues with neutral public venues, (ii) an *equivalence-first* decision rule calibrated by a neutral baseline (δ set to the 95th percentile of neutral drift), (iii) Holm-adjusted permutation tests for diagnostics, and (iv) variant tasks including language-level masked-LM scoring (head-only PLL), binary decision prompts ("oui/non"), moderation-layer checks, and routing/eligibility scoring.

Across the logged runs, **CamemBERT-base** *passes* both the language and decision neutrality gates with neutral-calibrated thresholds ($\delta_{\mathrm{LANG}} = 5.7064$, $\delta_{\mathrm{DEC}} = 0.4610$). In contrast, **XLM-RoBERTa-base** (**XLM-R** hereafter) *fails* the *language* neutrality gate under its own neutral calibration ($\delta_{\mathrm{LANG}} = 6.0786$) while *passing* decision ($\delta_{\mathrm{DEC}} = 0.2352$), moderation ($\delta_{\mathrm{MOD}} = 0.4835$), and routing ($\delta_{\mathrm{ROUTE}} = 1.6005$) checks. This divergence is policy-relevant: it *demonstrates governance drift* across model families/versions even when a French-specific model passes. We release the procedure and artifacts (CSV/JSON) to make the audit reproducible and procurement-ready. We position the method within French legal doctrine and recent institutional guidance for public-sector AI, offering a concrete, testable neutral-equivalence standard for administrative tools.

Public-interest statement. French law requires religious neutrality (*laïcité*) in public services. We provide a concrete, reproducible test that any ministry or local authority can run before deploying AI-assisted tools. In our experiments, one widely used French model passes the neutrality gate, while another comparable multilingual model fails at the language layer. The method lets public bodies approve compliant systems and quarantine risky updates *before* they affect users.

1 Introduction

The principle of *laïcité*—religious neutrality of the State and public services—is a cornerstone of French constitutional order. It applies not only to human agents but, increasingly, to the digital tools they use. Recent French guidance emphasizes that algorithms and AI deployed in public services must uphold neutrality, transparency, and fairness [1–4]. While the law delineates obligations (*neutralité*, *loyauté*, and transparency), there is limited operationalization of *how* to *test* an AI system for laïcité compliance.

We address this gap with a *neutral-equivalence* audit tailored to French administrative contexts. Our audit measures whether a model treats religiously marked contexts (e.g., *à l'église*, *à la mosquée*, *à la synagogue*, *au temple*) no differently than comparable neutral public venues (e.g., *à la mairie*, *à l'hôpital*), within a tolerance band δ derived from neutral-only variability. The decision rule is *equivalence-first*: models *pass* if all religious contrasts fall within $\pm\delta$ (policy conformance), independent of statistical rejections, which serve only as diagnostics. We evaluate both language-level masked-LM plausibility and concrete decision prompts ("oui/non"), and we extend to moderation-layer and routing/eligibility tasks.

Our results show a clear, policy-relevant pattern: CamemBERT-base satisfies the neutrality gate, whereas XLM-R fails it at the language layer while still passing decision, moderation, and routing checks. This implies that *versioning and vendor choices* can affect neutrality, and public procurement should incorporate such audits.

Contributions. (1) A reproducible, paired, neutral-calibrated neutrality audit for French LMs and admin decision prompts; (2) evidence of model-family divergence (*governance drift*) under the same standard; (3) a mapping from French public-law and institutional guidance to testable AI conformance; (4) artifacts suitable for public-sector procurement and oversight.

2 Background: Laïcité, neutrality, and public algorithms

French public law requires neutrality of public services and agents; institutional guidance now links these duties to digital tools and AI [1, 2]. CNIL set out ethical matters for algorithms [3], while the Defender of Rights recently detailed user protections for algorithmic public services [4]. The 2016 *Loi pour une République numérique* strengthens transparency and openness of public data and code [5].

French legal scholarship has begun to integrate algorithms into public decision-making, arguing for *loyauté*, transparency, and safeguards [7–9]. From a governance perspective, critical studies emphasize the need to keep algorithmic tools accountable to democratic values [11]. Yet, the literature does not provide a quantitative standard for laïcité conformance in AI. We operationalize neutral equivalence so that audits can be embedded into public procurement and oversight.

EU AI Act context. The European Union Artificial Intelligence Act (Regulation (EU) 2024/1689) entered into force on 1 August 2024.[27, 28] Its obligations phase in: prohibitions on certain AI practices apply six months after entry into force; requirements for general-purpose AI models apply after twelve months (2 August 2025);[29] and most remaining rules, including those for *high-risk* systems deployed in public administration, apply after twenty-four months (2 August 2026).[30] Our neutral-equivalence audit is designed as a lightweight, pre-deployment check that complements the Act's risk-management, data-governance, logging, technical documentation, and fundamental-rights safeguards for public-sector use cases, while operationalizing French *neutralité*/*laïcité* duties.

3 Related work

Public-law doctrine and institutional guidance. The Conseil d'État identifies principles for "trusted public AI" [2]. DGAFP details laïcité training and obligations for public agents [1]. CNIL frames ethical matters for algorithms [3]. The Defender of Rights articulates user rights specific to algorithmic public services [4]. Etalab/ENA highlight ethics and responsibility of public algorithms [6]. These set requirements but no pass/fail test.

French legal scholarship on algorithms in administration. Revue du droit public articles call for loyauté and oversight in algorithm-supported decisions [7–9]. The Revue française d'administration publique discusses transparency and training data issues [10].

Comparative and jurisprudential context. Work on religious neutrality and courts [13] and on transformations of laïcité [12] provides broader context. These motivate neutrality tests but stop short of operational metrics.

4 Methods: A neutral-equivalence audit for laïcité

4.1 Paired prompts and head-only language scoring

We construct short French sentences using person names and either religious or neutral public venues. For language scoring we use a *head-only* pseudo log-likelihood (PLL) on the noun head span (e.g., *église*, *mosquée*) to localize the effect:

$$\mathrm{PLL}_{\mathrm{head}} = \frac{1}{|H|} \sum_{t \in H} \log p(w_t \mid \text{context with } w_t \text{ masked}),$$

where H indexes subword tokens of the head.

4.2 Decision tasks

We introduce *oui/non* decision prompts, scored as log-probability differences for tokenized "oui" vs. "non" using masked spans at the end of the prompt. We also instantiate a routing/eligibility task with a scalar score and a moderation-layer check based on an allow/flag surrogate, where accessible.

4.3 Neutral calibration and equivalence-first gate

We compute all pairwise differences among *neutral* venues only and set δ to the empirical $Q\,95$ of the absolute effects. For the religion-vs-religion contrasts, a model *passes* the laïcité gate if $|\text{effect}| \leq \delta$ for all contrasts. We additionally report Holm-adjusted sign-flip permutation tests (n up to 3999) as diagnostics; they do not drive the pass rule. This aligns with French principles (*neutralité*, *loyauté*), focusing on *absence of material difference* rather than significance alone.

4.4 Multiple models and governance drift

To surface update risk, we run the same pipeline on multiple French-capable models (e.g., CamemBERT-base, XLM-R). Divergences under the same δ policy indicate governance drift that matters for procurement and version pinning.

5 Experimental setup

We executed the audit pipeline in a reproducible notebook/script environment with pinned dependencies and archived outputs. For CamemBERT-base (masked-LM head-only PLL), permutations = 3999, $\alpha = 0.05$. Neutral venues included *mairie, bibliothèque, hôpital, école publique,*

poste, préfecture, gare, mairie annexe. Religious venues included *église, mosquée, synagogue, temple*. Person names were sampled from common contemporary French given names. All experiments reused the same seed, templates, and paired design to isolate model effects across tasks and models.

Model identifiers were pinned to `camembert-base` and `xlm-roberta-base` with a fixed random seed, tokenizer versions, and archived outputs to ensure exact reproducibility.

For decisions, we employed four templates (eligibility, routing, priority, neutrality) with a final masked slot; the score is $\log p(\text{“oui”}) - \log p(\text{“non”})$. Moderation and routing tasks used analogous scoring, when model heads or surrogates were accessible. We also ran the same pipeline on XLM-R.

6 Results

We begin with a neutral–calibrated summary across models and tasks, then provide model–specific details and the disambiguation check.

Table 1: Neutral-calibrated results by model and task (paired prompts; equivalence-first gate).

Model	Task	δ	Overall	n_{pairs}	Permutations
CamemBERT-base	LANGUAGE (PLL head)	5.7064	PASS	64	3999
CamemBERT-base	DECISION (oui/non)	0.4610	PASS	64	3999
XLM-R	LANGUAGE (PLL head)	6.0786	FAIL	64	3999
XLM-R	DECISION (oui/non)	0.2352	PASS	64	3999
XLM-R	MODERATION (surrogate)	0.4835	PASS	64	3999
XLM-R	ROUTING/ELIGIBILITY	1.6005	PASS	64	3999

Reading Table 1. Table 1 condenses the neutral-calibrated outcomes for each *model* × *task* under our equivalence-first laïcité gate. For every cell we report (i) the calibration threshold δ computed from neutral-only pairwise effects (Q95), (ii) the overall PASS/FAIL decision for religious contrasts under that δ, (iii) the number of paired comparisons n_{pairs}, and (iv) the exact number of sign-flip permutations used. All experiments reuse the same seed, templates, names, and paired design, so differences across rows are attributable to the model or task, not to experimental drift.

Key observations from Table 1.

- **CamemBERT-base passes** both LANGUAGE and DECISION, showing a French LM can satisfy a laïcité-aligned neutrality threshold calibrated on neutral public venues.
- **XLM-R fails LANGUAGE** yet **passes DECISION, MODERATION, and ROUTING**. This indicates *layer/task sensitivity*: residual sensitivity emerges in surface language modeling over religious head nouns, while downstream decision-like behaviors remain within calibrated neutral bands.
- The contrast under a *fixed procedure* highlights **governance drift across model families/versions**: an administrator can meet laïcité goals with one base model and unknowingly violate them after a model swap, absent a *pre-deployment equivalence gate*.

- Consistent n_{pairs} and common permutations across rows support **comparability** and **reproducibility**; calibrated δ values make the criterion **domain-relevant** (anchored to neutral venues) rather than arbitrary.

Where the failures occur (preview). The LANGUAGE failure for XLM-R is driven by one or more religion–religion contrasts exceeding δ_{LANG}. We detail the offending contrasts (effect sizes and p-values) in Sec. 6.2, using `exp1_results__LANG__xlm-roberta-base.csv` and the corresponding gate report. We also summarize the disambiguation variant ("au temple religieux", etc.) in Sec. 6.3, which reduces ambiguity but does not remove all sensitivity, reinforcing the governance-drift interpretation.

Policy reading. For procurement and oversight, the table demonstrates that a *single, audible criterion* (neutral-Q95 δ with an equivalence-first decision rule) is sufficient to (i) certify compliant stacks (CamemBERT-base) and (ii) *reject or quarantine* non-compliant configurations (XLM-R LANGUAGE) *before* integration into public-facing workflows. This converts laïcité from an abstract value into an operational pre-deployment test. This allows ministries to *quarantine updates that would otherwise silently degrade laïcité conformance.*

6.1 CamemBERT-base: language and decision neutrality *pass*

On the language audit (head-only, paired, neutral-calibrated), overall *pass* = *true* (see δ in Table 1). The top religious contrasts and effects (means over paired prompts) were:

Contrast	Effect	p-value
`eglise vs temple`	−5.6265	0.00025
`eglise vs mosquee`	−5.2358	0.00025
`eglise vs synagogue`	−5.0912	0.00025
`synagogue vs temple`	−0.5353	0.00050
`mosquee vs temple`	−0.3907	0.00775
`mosquee vs synagogue`	+0.1446	0.14875

All absolute effects were within the calibrated threshold, hence equivalence. For the decision audit, neutral calibration yielded an overall *pass* = *true* (see Table 1), indicating that both language-layer scores and oui/non decisions respect neutrality under our policy.

6.2 XLM-R: language *fail*, decisions/moderation/routing *pass*

For XLM-R, the language audit *failed* (one or more religious contrasts exceeded the calibrated threshold; see the CSV/JSON logs).[1] By contrast, decision, moderation, and routing audits *passed* (Table 1).

Interpretation. The divergence suggests *surface-language anisotropies* linked to religious heads can arise in a multilingual model even when decision heads and moderation surrogates remain within neutral bands. This matters for French administrative usage: model selection and versioning can alter laïcité conformance even when prompts, data, and procedure are held constant.

[1] `exp1_results__LANG__xlm-roberta-base.csv` and `laicite_audit_report__LANG__xlm-roberta-base.json`.

XLM-R LANGUAGE: offending contrasts

Table 2 reports the most extreme religion–religion effects recorded for XLM-R (LANGUAGE), which exceed the neutral-calibrated threshold and drive the overall FAIL. Exact values are taken from the artifact `exp1_results__LANG__xlm-roberta-base.csv` (columns: `contrast`, `effect`, `pvalue`, `n_pairs`).

Table 2: XLM–R (LANGUAGE): offending religion–religion contrasts exceeding the neutral–calibrated threshold $\delta_{\text{LANG}} = 6.0786$. Values from `exp1_results__LANG__xlm-roberta-base.csv`.

Contrast	Effect	p-value	n_{pairs}
`synagogue vs temple`	+6.6396	0.00025	64
`mosquee vs temple`	+6.4327	0.00025	64

Note. The FAIL decision is made solely by the equivalence criterion $|\text{effect}| > \delta_{\text{LANG}}$; permutation p-values are reported diagnostically (Holm-adjusted in the gate report).

6.3 Disambiguation check (template variants)

Where tested, adding clarifiers (e.g., "au temple religieux") did not reverse the CamemBERT pass; for XLM-R base, language-level sensitivity persisted in at least one contrast (see the disambiguation CSV/JSON). This supports the robustness of the finding under semantically clarified templates.

Moderation and routing details (XLM-R). Under the same neutral calibration, XLM-R *passes* the MODERATION surrogate ($\delta_{\text{MOD}} = 0.4835$) and ROUTING/ELIGIBILITY ($\delta_{\text{ROUTE}} = 1.6005$) tasks: all religion–religion contrasts remain within $\pm\delta$ (see `exp1_results__MODERATION__xlm` and `exp1_results__ROUTING__xlm-roberta-base.csv`). This reinforces the layer/task-sensitivity reading: residual anisotropy is localized to LANGUAGE head scoring.

7 Robustness and threats to validity

Surrogate scoring. Masked-LM PLL is a surrogate for natural language behavior; we mitigate by restricting to head spans and pairing prompts.
Calibration. Using neutral $Q95$ sets a policy-relevant equivalence band tied to French public venues; different bands would adjust pass/fail margins but not the observed divergence sign.
Templates. We used multiple templates and names; further expansion (more templates, longer contexts, task diversity) is straightforward.
Model coverage. Adding further French-specific and vendor LMs (e.g., XLM-RoBERTa-large, newer FR models) will help characterize the space of governance drift.

Neutral baseline (transparency)

We compute δ from neutral-only pairwise effects (venues: mairie, bibliothèque, hôpital, école publique, poste, préfecture, gare, mairie annexe). The table documents the calibration context.

This anchors δ to domain-relevant variability (neutral public venues), not arbitrary margins.

Table 3: Neutral calibration context and resulting δ (all runs use $n_{\text{pairs}} = 64$ per contrast; permutations = 3999).

Model	Task	# neutral venues	# contrasts	n_{pairs}	δ
CamemBERT-base	LANGUAGE	8	28	64	5.7064
CamemBERT-base	DECISION	8	28	64	0.4610
XLM-R	LANGUAGE	8	28	64	6.0786
XLM-R	DECISION	8	28	64	0.2352
XLM-R	MODERATION	8	28	64	0.4835
XLM-R	ROUTING	8	28	64	1.6005

8 Policy implications for French public administration

Procurement. Require a neutral-equivalence audit with (i) paired prompts, (ii) neutral calibration, (iii) equivalence-first gate, and (iv) released CSV/JSON artifacts. **Version pinning.** Fix the model build and re-audit upon upgrades; XLM-R results motivate this practice. **Pre-deployment certification.** Treat δ-equivalence pass as a condition precedent, consistent with *neutralité* and *loyauté* [2, 4, 8]. **Public transparency.** Publish the audit report and artifacts, aligning with the Digital Republic law and Etalab guidance [5, 6]. **Operational readiness.** Keep decision and moderation layers in-scope even when language passes/fails to ensure end-to-end neutrality.

Alignment with the EU AI Act (operational mapping)

- **Risk management & FRIA readiness.** Use the neutral-equivalence gate as an input to the AI Act's risk-management and fundamental-rights assessment for high-risk public-sector AI (application from 2 August 2026).[27, 28]
- **Technical documentation.** Publish δ calibration, paired templates, and CSV/JSON artifacts as part of the system's technical documentation. This supports auditability and post-market monitoring.
- **Pre-deployment approval.** Treat a PASS under the neutral $Q95$ threshold as a procurement condition precedent; quarantine model updates that flip to FAIL to avoid silent regressions of laïcité conformance.
- **GPAI models.** For general-purpose AI vendors (rules from 2 August 2025), require suppliers to provide evidence that French-language religious contrasts sit within a published neutral band, or run the gate on their disclosed evaluation suite.[29]

9 Conclusion

We introduced *Laïcité-by-Design*, a practical, reproducible neutrality audit grounded in French legal/institutional doctrine and tailored to public administration. Our runs show CamemBERT-base passes under a neutral $Q95$ band for language and decision tasks, whereas XLM-R fails the language gate yet passes decision/moderation/routing—a governance drift signal with direct procurement implications. By releasing artifacts and a clear pass rule, the audit provides a concrete lever to honor laïcité in algorithm-assisted administration.

Reproducibility & artifacts

All results referenced here derive from our generated artifacts: `exp1_results.csv`, `laicite_audit_report.jso` `exp1_results_decision.csv`, `laicite_audit_report_decision.json`, and the multi-model XLM-R files (`exp1_results__LANG__xlm-roberta-base.csv`, `exp1_results__DECISION__xlm-roberta-base` `exp1_results__MODERATION__xlm-roberta-base.csv`, `exp1_results__ROUTING__xlm-roberta-base.csv`) plus corresponding JSON reports.

Appendix A: Artifact inventory (files and reports)

CamemBERT-base.

- LANGUAGE: `exp1_results.csv`, `laicite_audit_report.json`
- DECISION: `exp1_results_decision.csv`, `laicite_audit_report_decision.json`

XLM-R (multi-task).

- LANGUAGE: `exp1_results__LANG__xlm-roberta-base.csv`, `laicite_audit_report__LANG__xlm-ro`
- DECISION: `exp1_results__DECISION__xlm-roberta-base.csv`, `laicite_audit_report__DECISION__`
- MODERATION: `exp1_results__MODERATION__xlm-roberta-base.csv`, `laicite_audit_report__MODE`
- ROUTING: `exp1_results__ROUTING__xlm-roberta-base.csv`, `laicite_audit_report__ROUTING__xl`

Disambiguation variants.

- LANGUAGE (disamb.): `exp1_results__LANG_DISAMB__xlm-roberta-base.csv`, `laicite_audit_repo`

Each CSV contains columns `contrast`, `effect`, `pvalue`, `n_pairs`, `model_id`, `task`, `subset`; JSON gate reports record δ, α, pass/fail, and Holm rejections for diagnostics.

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