# Appendix for:
# Large Language Models for Code Linting: How Far Are We?

## A Detailed Checkstyle Results for Individual Sub-Rules

Table 1 presents the detailed Checkstyle results, including **TP**, **FP**, **FN**, **Precision**, **Recall**, and **F1-score** for each sub-rule, together with the corresponding rule name and relation type. Based on the per-sub-rule F1-scores, 22 sub-rules (21.4%) have an F1-score of 0, 53 sub-rules (51.5%) have an F1-score of 1.0, and the remaining 28 sub-rules (27.1%) have F1-scores between 0 and 1.0.

Aggregating all sub-rules, the overall performance of Checkstyle on this benchmark is as follows: **TP = 617**, **FP = 54**, **FN = 282**, **Precision = 0.920**, **Recall = 0.686**, and **F1-score = 0.786**.

**Table 1:** Per–sub-rule results: mapping each rule and sub-rule to its relation type and PRF metrics.

| Rule | SubRule | Relation | TP | FP | FN | Precision | Recall | F1 |
|---|---|---|---|---|---|---|---|---|
| Rule001_2-1_File_name | SR01_FileNameMatchesClassName | Containment Relation | 18 | 0 | 8 | 1.000 | 0.692 | 0.818 |
| Rule002_2-2_File_encoding_UTF-8 | SR01_UTF8 | Property Restriction Relation | 0 | 0 | 3 | 0.000 | 0.000 | 0.000 |
| Rule003_2-3-1_Whitespace_characters | SR01_Only0x20 | Property Restriction Relation | 9 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule004_2-3-2_Special_escape_sequences | SR01_SpecialEscape | Property Restriction Relation | 16 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule005_2-3-3_Non-ASCII_characters | SR01_NonAsciiCharacter | Property Restriction Relation | 0 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| | SR02_EasierToRead | Property Restriction Relation | 0 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| | SR03_AvoidEscapedUnicodeCharactersOutsideStringLiteralsAndComments | Containment Relation | 0 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule006_3_Source_file_structure | SR01_FileConponentOrder | Order Relation | 2 | 0 | 2 | 1.000 | 0.500 | 0.667 |
| | SR02_OneBlankLineSeparating | Separation Relation | 10 | 2 | 2 | 0.833 | 0.833 | 0.833 |
| Rule007_3-2_Package_statement | SR01_PackageStatementLength | Quantity Restriction Relation | 0 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| | SR02_PackageStatementNoLineWrap | Containment Relation | 3 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule008_3-3-1_No_wildcard_imports | SR01_NoWildcardImport | Containment Relation | 2 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule009_3-3-2_No_line-wrapping | SR01_ImportStatementLength | Quantity Restriction Relation | 0 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule009_3-3-2_No_line-wrapping | SR02_ImportStatementNoLineWrap | Containment Relation | 3 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule010_3-3-3_Ordering_and_spacing | SR01_ImportsSeparating | Separation Relation | 17 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule010_3-3-3_Ordering_and_spacing | SR02_ImportsOrder | Order Relation | 5 | 0 | 0 | 1.000 | 1.000 | 1.000 |

| Rule | SubRule | Relation | TP | FP | FN | Precision | Recall | F1 |
|---|---|---|---|---|---|---|---|---|
| Rule011_3-3 -4_No_static _import_for_ classes | SR01_NoStaticNestedCl assImport | Containment Relation | 0 | 0 | 1 | 0.000 | 0.000 | 0.000 |
| Rule012_3-4 -1_Exactly_ one_top-leve l_class_decla ration | SR01_OneTopLevelClas s | Quantity Restriction Relation | 7 | 0 | 7 | 1.000 | 0.500 | 0.667 |
| Rule013_3-4 -2-1_Overlo ads__never_s plit | SR01_OverloadsNeverSp lit | Separation Relation | 2 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule014_3-5 -1_Ordering _and_spacin g_of_module _directives | SR01_ModuleDirectives Order | Order Rela- tion | 0 | 0 | 3 | 0.000 | 0.000 | 0.000 |
| | SR02_OneBlankLineSep aratingDirectives | Separation Relation | 0 | 0 | 3 | 0.000 | 0.000 | 0.000 |
| Rule015_4-1 -1_Use_of_o ptional_brac es | SR01_NeedBraces | Accompany Relation | 5 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| | SR02_OtherBracesOptio nal | Accompany Relation | 0 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule016_4-1 -2_Nonempt y_blocks__K _&_R_style | SR01_NoLineBreakBefor eOpeningBrace | Accompany Relation | 17 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| | SR02_LineBreakAfterO peningBrace | Accompany Relation | 16 | 0 | 3 | 1.000 | 0.842 | 0.914 |
| | SR03_LineBreakBeforeC losingBrace | Accompany Relation | 16 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| | SR04_LineBreakAfterCl osingBrace | Accompany Relation | 16 | 1 | 3 | 0.941 | 0.842 | 0.889 |
| | SR05_BreakBeforeScope Block | Accompany Relation | 0 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule017_4-1 -3_Empty_b locks__may_ be_concise | SR01_ConciseForNonM ultiblock | Property Restriction Relation | 0 | 3 | 5 | 0.000 | 0.000 | 0.000 |
| Rule018_4-2 _Block_inde ntation__+2 _spaces | SR01_OpenBlockIndent ation | Quantity Restriction Relation | 88 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| | SR02_EndedBlockInden tation | Quantity Restriction Relation | 44 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule019_4- 3_One_state ment_per_li ne | SR01_OneStatementPer Line | Quantity Restriction Relation | 2 | 0 | 7 | 1.000 | 0.222 | 0.364 |
| Rule020_4- 4_Column_li mit__100 | SR01_LineLength | Quantity Restriction Relation | 1 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| | SR02_SpecialLineLength | Quantity Restriction Relation | 0 | 4 | 0 | 0.000 | 0.000 | 0.000 |
| Rule021_4-5 -1_Where_to _break | SR01_BreakBeforeNonA ssignmentOperator | Accompany Relation | 16 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| | SR02_BreakAfterAssign mentOperator | Accompany Relation | 0 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| | SR03_NameAttachToPa renthesis | Separation Relation | 6 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| | SR04_CommaAttachTo TokenPrecedes | Separation Relation | 16 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| | SR05_NoArrowBreak | Accompany Relation | 0 | 0 | 10 | 0.000 | 0.000 | 0.000 |
| Rule022_4-5 -2_Indent_c ontinuation _lines_at_lea st_+4_space s | SR01_WrappingIndenta tion | Quantity Restriction Relation | 71 | 2 | 10 | 0.973 | 0.876 | 0.922 |

| Rule | SubRule | Relation | TP | FP | FN | Precision | Recall | F1 |
|------|---------|----------|----|----|----|-----------|--------|-----|
| | SR02_SameIndentationForParallelElement | Quantity Restriction Relation | 0 | 0 | 39 | 0.000 | 0.000 | 0.000 |
| Rule023_4-6-1_Vertical_Whitespace | SR01_EmptyLineSeparatingConsecutiveMembers | Separation Relation | 5 | 2 | 0 | 0.714 | 1.000 | 0.833 |
| | SR02_OptionalEmptyLine | Separation Relation | 0 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| | SR03_MultiEmptyLine | Quantity Restriction Relation | 0 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule024_4-6-2_Horizontal_whitespace | SR01_SpaceBetweenReservedWordAndOpenParenthesis | Separation Relation | 3 | 3 | 25 | 0.500 | 0.107 | 0.176 |
| | SR02_SpaceBetweenCloseBraceAndReservedWord | Separation Relation | 0 | 2 | 6 | 0.000 | 0.000 | 0.000 |
| | SR03_SpaceBeforeOpenBrace | Accompany Relation | 9 | 0 | 20 | 1.000 | 0.310 | 0.474 |
| | SR04_SpaceAroundOperator | Accompany Relation | 24 | 4 | 17 | 0.857 | 0.585 | 0.696 |
| | SR05_SpaceAfterSeparator | Accompany Relation | 8 | 0 | 11 | 1.000 | 0.421 | 0.593 |
| | SR06_MultiSpaceAroundComment | Separation Relation | 0 | 0 | 5 | 0.000 | 0.000 | 0.000 |
| | SR07_SpaceBetweenTypeAndVariable | Separation Relation | 3 | 0 | 18 | 1.000 | 0.143 | 0.250 |
| | SR08_InsideBraces | Accompany Relation | 0 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| | SR09_SpaceBetweenTypeAnnotatioAndSpecialSignals | Separation Relation | 0 | 0 | 8 | 0.000 | 0.000 | 0.000 |
| | SR10_SpaceAtTheStartOrEnd | Accompany Relation | 0 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule025_4-8-1_Enum_classes | SR01_BlankLineAfterCommaInEnum | Accompany Relation | 0 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule026_4-8-2-1_One_variable_per_declaration | SR01_OneVariablePerDeclaration | Quantity Restriction Relation | 2 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule027_4-8-3-2_No_C-style_array_declarations | SR01_NoCStyle | Order Relation | 4 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule028_4-8-4-1_Indentation | SR01_SwitchIndentation | Quantity Restriction Relation | 17 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule029_4-8-4-2_Fall-through__commented | SR01_FallThroughCommentInOldStyleSwitch | Accompany Relation | 4 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule030_4-8-4-3_Presence_of_the_default_label | SR01_SwitchNeedDefault | Containment Relation | 6 | 2 | 4 | 0.750 | 0.600 | 0.667 |
| Rule031_4-8-5-1_Type-use_annotations | SR01_TypeAnnotationPlace | Order Relation | 0 | 0 | 5 | 0.000 | 0.000 | 0.000 |
| Rule032_4-8-5-2_Class_annotations | SR01_ClassModulePackageAnnotationPlace | Order Relation | 0 | 0 | 4 | 0.000 | 0.000 | 0.000 |
| | SR02_ClassModulePackageAnnotationNum | Quantity Restriction Relation | 2 | 0 | 2 | 1.000 | 0.500 | 0.667 |
| | SR03_NoIndentationWhenBreak | Quantity Restriction Relation | 1 | 0 | 2 | 1.000 | 0.333 | 0.500 |
| Rule033_4-8-5-3_Method_and_constructor_annotations | SR01_MethodAnnotationPlace | Order Relation | 0 | 0 | 4 | 0.000 | 0.000 | 0.000 |
| | SR02_MethodAnnotationNum | Quantity Restriction Relation | 2 | 0 | 0 | 1.000 | 1.000 | 1.000 |

| Rule | SubRule | Relation | TP | FP | FN | Precision | Recall | F1 |
|------|---------|----------|----|----|----|-----------|--------|-----|
| | SR03_MethodAnnotatio nSpecialCase | Accompany Relation | 2 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule034_4-8 -5-4_Field_a nnotations | SR01_FieldAnnotationP lace | Order Rela- tion | 0 | 0 | 2 | 0.000 | 0.000 | 0.000 |
| | SR02_FieldAnnotationN um | Quantity Restriction Relation | 0 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule035_4-8 -6-1_Block_c omment_sty le | SR01_BlockIndentation | Quantity Restriction Relation | 2 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| | SR02_MultiLineComme nt | Accompany Relation | 0 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| | SR03_NoDrawnBoxes | Containment Relation | 0 | 0 | 3 | 0.000 | 0.000 | 0.000 |
| Rule036_4-8 -7_Modifiers | SR01_ModierOrderOnCl assAndMember | Order Rela- tion | 6 | 2 | 6 | 0.750 | 0.500 | 0.600 |
| | SR02_ModierOrderOnR equires | Order Rela- tion | 0 | 0 | 1 | 0.000 | 0.000 | 0.000 |
| Rule037_4-8 -8_Numeric_ Literals | SR01_NoLowerL | Containment Relation | 4 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule038_5-2 -1_Package_ names | SR01_PackageNaming | Containment Relation | 3 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule039_5-2 -2_Class_na mes | SR01_ClassNaming | Property Restriction Relation | 9 | 1 | 0 | 0.900 | 1.000 | 0.947 |
| | SR02_ClassNameNoun | Property Restriction Relation | 0 | 0 | 1 | 0.000 | 0.000 | 0.000 |
| Rule040_5-2 -3_Method_ names | SR01_MethodNaming | Property Restriction Relation | 7 | 4 | 0 | 0.636 | 1.000 | 0.778 |
| Rule040_5-2 -3_Method_ names | SR02_MethodNameVerb | Property Restriction Relation | 0 | 0 | 1 | 0.000 | 0.000 | 0.000 |
| Rule041_5-2 -4_Constant _names | SR01_ConstantNaming | Property Restriction Relation | 5 | 5 | 5 | 0.500 | 0.500 | 0.500 |
| Rule042_5-2 -5_Non-cons tant_field_n ames | SR01_NoneConstantFiel dNaming | Property Restriction Relation | 6 | 1 | 6 | 0.857 | 0.500 | 0.632 |
| | SR02_FieldNameNoun | Property Restriction Relation | 0 | 0 | 4 | 0.000 | 0.000 | 0.000 |
| Rule043_5-2 -6_Paramet er_names | SR01_ParameterNaming | Property Restriction Relation | 5 | 1 | 0 | 0.833 | 1.000 | 0.909 |
| | SR02_AvoidSingleCharP arameter | Quantity Restriction Relation | 3 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule044_5-2 -7_Local_var iable_names | SR01_LocalVariableNa ming | Property Restriction Relation | 6 | 1 | 1 | 0.857 | 0.857 | 0.857 |
| Rule045_5-2 -8_Type_var iable_names | SR01_TypeVariableNam ing | Property Restriction Relation | 9 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule046_6-1 _@Override_ always_used | SR01_OverrideAnnotati on | Accompany Relation | 0 | 0 | 3 | 0.000 | 0.000 | 0.000 |
| | SR02_OmitOverrideAnn otationWhenDeprecated | Accompany Relation | 0 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule047_6-2 _Caught_exc eptions_not _ignored | SR01_NoEmptyCaught | Containment Relation | 2 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule048_6-3 _Static_mem bers_qualifi ed_using_cla ss | SR01_StaticClassUsage | Property Restriction Relation | 0 | 0 | 2 | 0.000 | 0.000 | 0.000 |

| Rule | SubRule | Relation | TP | FP | FN | Precision | Recall | F1 |
|---|---|---|---|---|---|---|---|---|
| Rule049_6-4 _Finalizers_ not_used | SR01_NoFinalizers | Containment Relation | 1 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule050_7-1 -1_General_f orm | SR01_JavadocForm | Accompany Relation | 5 | 0 | 7 | 1.000 | 0.417 | 0.588 |
| Rule051_7-1 -2_Paragrap hs | SR01_BlankLinePosition | Separation Relation | 2 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| | SR02_Paragraphs | Accompany Relation | 6 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule052_7-1 -3_Block_ta gs | SR01_BlockTagOrder | Order Rela- tion | 4 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| | SR02_NoEmptyDescipti onInBlockTag | Containment Relation | 5 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| | SR03_LineBreakInBlock Tag | Quantity Restriction Relation | 4 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| Rule053_7-2 _The_summ ary_fragmen t | SR01_SummaryFragmen tFormat | Containment Relation | 2 | 0 | 2 | 1.000 | 0.500 | 0.667 |
| | SR02_SummaryFragmen tPosition | Accompany Relation | 1 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| | SR03_VerbOrNounPhra se | Property Restriction Relation | 2 | 0 | 1 | 1.000 | 0.667 | 0.800 |
| Rule054_7-3 _Where_Jav adoc_is_used | SR01_JavadocPosition | Accompany Relation | 18 | 14 | 0 | 0.562 | 1.000 | 0.720 |
| Rule055_7-3 -4_Non-requ ired_Javado c | SR01_WheneverUse | Accompany Relation | 0 | 0 | 0 | 1.000 | 1.000 | 1.000 |
| | **Overall** | | 617 | 54 | 282 | 0.920 | 0.686 | 0.786 |