

Appendix A - Induced rules

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In this appendix, the distributions of symbolic features are analyzed. The histogram of values for each symbolic features is plotted with regard to class.

Figure 1: Rules induced by RIPPER

- 1: IF number_of_obj = *lots*
THEN *centromere*
- 2: IF mitotic_cells = *bright_middle*
THEN *homogeneos*
- 3: IF organelle_type = *bright_on_dark*
THEN *nucleolar*
- 4: IF texture = *rough*
THEN *coarse speckled*
- 5: IF shape = *circular* AND number_of_obj = *few*
THEN *fine speckled*
- 6: IF shape = *irregular*
THEN *cytoplasmatic*
- 7: IF mitotic_cells = *dark spot* AND organelle_type = *neutral*
THEN *fine speckled*
- 8: IF intensity = *intermediate* AND mitotic_cells = *neutral*
THEN *nucleolar*
- 9: IF mitotic_cells = *neutral* AND speckled = *homogeneous*
THEN *fine speckled*
- 10: else *cytoplasmatic*

Figure 2: Rules induced by Decision tree

- 1: IF mitotic_cells = *bright middle* AND number_of_obj = *few*
THEN *homogeneous*
- 2: IF mitotic_cells = *bright middle* AND number_of_obj = *lots*
THEN *centromere*
- 3: IF mitotic_cells = *bright middle* AND number_of_obj = *none*
THEN *homogeneous*
- 4: IF mitotic_cells = *bright middle sparkle*
THEN *centromere*
- 5: IF mitotic_cells = *dark spot* AND texture = *blob*
THEN *cytoplasmatic*
- 6: IF mitotic_cells = *dark spot* AND texture = *rough* AND organelle_type = *bright_on_dark*
THEN *coarse speckled*
- 7: IF mitotic_cells = *dark spot* AND texture = *rough* AND organelle_type = *dark_on_bright* AND
speckles = *homogeneous*
THEN *fine speckled*
- 8: IF mitotic_cells = *dark spot* AND texture = *rough* AND organelle_type = *dark_on_bright* AND
speckles = *speckled*
THEN *coarse speckled*
- 9: IF mitotic_cells = *dark spot* AND texture = *rough* AND organelle_type = *neutral*
THEN *coarse speckled*
- 10: IF mitotic_cells = *dark spot* AND texture = *smooth* AND organelle_type = *bright_on_dark*
AND intensity = *intermediate*
THEN *fine speckled*
- 11: IF mitotic_cells = *dark spot* AND texture = *smooth* AND organelle_type = *bright_on_dark*
AND intensity = *positive*
THEN *nucleolar*
- 12: IF mitotic_cells = *dark spot* AND texture = *smooth* AND organelle_type = *dark_on_bright*
AND number_of_obj = *few*
THEN *fine speckled*
- 13: IF mitotic_cells = *dark spot* AND texture = *smooth* AND organelle_type = *dark_on_bright*
AND number_of_obj = *lots*
THEN *fine speckled*
- 14: IF mitotic_cells = *dark spot* AND texture = *smooth* AND organelle_type = *dark_on_bright*
AND number_of_obj = *none*
THEN *cytoplasmatic*
- 15: IF mitotic_cells = *dark spot* AND texture = *smooth* AND organelle_type = *neutral*
THEN *fine speckled*
- 16: IF mitotic_cells = *neutral* AND organelle_type = *bright_on_dark*
THEN *nucleolar*
- 17: IF mitotic_cells = *neutral* AND organelle_type = *dark_on_bright* AND texture = *rough* AND
intensity = *intermediate*
THEN *coarse speckled*
- 18: IF mitotic_cells = *neutral* AND organelle_type = *dark_on_bright* AND texture = *rough* AND
intensity = *positive*
THEN *fine speckled*
- 19: IF mitotic_cells = *neutral* AND organelle_type = *dark_on_bright* AND texture = *smooth*
THEN *fine speckled*
- 20: IF mitotic_cells = *neutral* AND organelle_type = *neutral* AND number_of_obj = *few*
THEN *nucleolar*
- 21: IF mitotic_cells = *neutral* AND organelle_type = *neutral* AND number_of_obj = *lots*
THEN *coarse speckled*
- 22: IF mitotic_cells = *neutral* AND organelle_type = *neutral* AND number_of_obj = *none* AND
intensity = *intermediate*
THEN *nucleolar*
- 23: IF mitotic_cells = *neutral* AND organelle_type = *neutral* AND number_of_obj = *none* AND
intensity = *positive*
THEN *fine speckled*
- 24: IF mitotic_cells = *unknown* AND number_of_obj = *few*
THEN *nucleolar*
- 25: IF mitotic_cells = *unknown* AND number_of_obj = *none*
THEN *cytoplasmatic*

Figure 3: Rules induced by FOIL

- 1: IF shape = *irregular*
THEN *cytoplasmatic*
- 2: IF texture = *blob*
THEN *cytoplasmatic*
- 3: IF intensity = *intermediate* AND speckles = *speckled* AND texture = *rough*
THEN *coarse speckled*
- 4: IF texture = *rough* AND organelle_type = *neutral* AND mitotic_type = *dark spot*
THEN *coarse speckled*
- 5: IF intensity = *positive* AND texture = *rough* AND organelle_type = *dark* AND number_of_organelles = *few*
THEN *coarse speckled*
- 6: IF organelle_type = *bright* AND number_of_organelles = *lots*
THEN *centromere*
- 7: IF mitotic_type = *bright middle* AND number_of_organelles = *lots*
THEN *centromere*
- 8: IF intensity = *intermediate* AND speckled = *speckled* AND organelle_type = *bright*
AND number_of_organelles = *few*
THEN *centromere*
- 9: IF intensity = *intermediate* AND speckled = *speckled* AND texture = *smooth* AND
organelle_type = *bright* AND number_of_objects = *few*
THEN *nucleolar*
- 10: IF intensity = *positive* AND organelle_type = *bright* AND number_of_objects = *few*
AND mitotic_type = not *bright middle*
THEN *nucleolar*
- 11: IF organelle_type = *neutral* AND number_of_objects = *few* AND mitotic_type = *neu-*
tral
THEN *nucleolar*
- 12: IF intensity = *positive* AND mitotic_type = *bright middle*
THEN *homogeneous*
- 13: IF organelle_type = *neutral* AND speckles = *speckled* AND mitotic_type = *neutral*
THEN *homogeneous*
- 14: IF speckles = *homogeneous* AND mitotic_type = *bright middle*
THEN *homogeneous*
- 15: IF texture = *smooth* AND organelle_type = *dark* AND mitotic_type = *neutral*
THEN *fine speckled*
- 16: IF speckles = *homogeneous* AND texture = *smooth* AND mitotic_type = *dark spot*
AND number_of_objects = not *none*
THEN *fine speckled*
- 17: IF intensity = *positive* AND texture = *smooth* AND mitotic_type = *dark spot* AND
organelle_type = not *neutral*
THEN *fine speckled*
- 18: IF intensity = *intermediate* AND texture = *smooth* AND organelle_type = not *smooth*
THEN *fine speckled*

Figure 4: Rules induced by ALPEH

- 1: IF number_of_obj = *lots* AND mitotic_type = not *dark spot* AND mitotic_type = not *neutral*
THEN *centromere*
- 2: IF texture = *rough* AND number_of_objects = *few* AND intensity = *intermediate*
THEN *coarse speckled*
- 3: IF texture = *smooth* AND organelle_type = *dark* AND mitotic_type = *neutral*
THEN *fine speckled*
- 4: IF speckles = *homogeneous* AND texture = *smooth* AND mitotic_type = *dark spot*
AND number_of_objects = not *none*
THEN *fine speckled*
- 5: IF intensity = *positive* AND texture = *smooth* AND mitotic_type = *dark spot* AND
organelle_type = not *neutral*
THEN *fine speckled*
- 6: IF intensity = *intermediate* AND texture = *smooth* AND organelle_type = not *smooth*
THEN *fine speckled*
- 7: IF organelle_type = *dark* AND number_of_objects = *lots*
THEN *fine speckled*
- 8: IF organelle_type = *bright* AND speckles = *homogeneous* AND mitotic_type = not
neutral
THEN *fine speckled*
- 9: IF mitotic_type = *bright middle* AND intensity = *positive*
THEN *homogeneous*
- 10: IF shape = *irregular*
THEN *cytoplasmatic*
- 11: IF texture = *blob*
THEN *cytoplasmatic*
- 12: IF organelle_type = *bright* AND intensity = *positive* AND mitotic_type = not *bright*
middle
THEN *nucleolar*
- 13: IF organelle_type = not *dark* AND number_of_objects = *few* AND mitotic_type = not
neutral
THEN *nucleolar*
- 14: IF speckles = *speckled* AND number_of_objects = *none* AND mitotic_type = *neutral*
THEN *nucleolar*